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INCLUDING

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BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY

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"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exculta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

. . . . . The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands wild
And odorous branches at our feet; the Nymphs
That press with nimble step the mountain-thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep: the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.

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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

"..... per litora spargite muscum,
Naiades, et circum vitreos considite fontes:
Pollice virgineo teneros hic carpite flores:
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Crateridcs, ite sub undas;
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchylia succo."
N. Parthenii Giannettasi, Ecl. 1.

No. 37. JANUARY 1911.

I.—*The Anatomy and Classification of the Teleostean Fishes of the Orders Berycomorphi and Xenoberyces.* By C. Tate Regan, M.A.

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[Plate I.]

The Berycomorphous fishes are a group of considerable interest, for on the one hand they approach the Perches in general structure, and on the other they retain many features of generalization which indicate their relationship to primitive Clupeoids.

The order was well represented in Cretaceous times, and the fossil genera were included in the fourth volume of Dr. Smith Woodward's 'Catalogue of Fossil Fishes,' issued in 1901. The best descriptions and figures of the extinct species are those of W. von der Marck (Palæont. xi. 1863) and of Smith Woodward (Palæontogr. Soc. 1902). Dr. E. C. Starks has given a useful account of the osteology of some of the recent types, with figures of the crania of *Polymixia*, *Beryx*, *Hoplostethus*, *Monocentris*, and *Holocentrus* (Proc. U.S. Nat. Mus. xxvii. 1904); I fully agree with him that the Pempheridæ do not pertain to this order, but to the Percomorphi. The skeleton of *Holocentrus* has been figured by Agassiz (Poiss. Foss. vol. iv.) and that of *Beryx* by Günther ('Challenger' Deep-sea Fishes).

In the following account both recent and extinct forms are dealt with, and the more important characters of the order and its component families are set forth; three families, Berycopsidæ, Diretmidæ, and Anomalopidæ, hitherto regarded as of uncertain affinities, are assigned a definite place in the system, and the Melamphaidæ, until now included in the Berycidæ, are rejected from the order.

Order Berycomorphi.

Parietals separated by the supraoccipital; nasals large, posteriorly attached to the frontals; opisthotic well-developed, bounded in front by the pro-otic and below by the exoccipital; orbitosphenoid present, united by suture with the alisphenoids, but well separated from the mesethmoid; a Y-shaped basisphenoid present; a thin-walled auditory bulla, containing a large otolith, formed by the pro-otic, parasphenoid, basi-occipital, exoccipital, and sometimes the opisthotic. Mouth bordered above by the protractile præmaxillaries; maxillary articulated with the vomer and attached near its proximal end to the well-developed maxillary process of the palatine; one or two supramaxillaries; lower jaw of dentary, articulare and angulare. First pharyngobranchial suspensory; third and fourth ankylosed; lower pharyngeals separate; three ossified basi-branchials. 4 gills; pseudobranchiæ; 7 to 9 branchiostegals. Hyo-palatine and opercular bones normally developed. Vertebral column of solid centra which are co-ossified with the arches; anterior ribs sessile; posterior ribs on parapophyses; hypurals more or less fused and expanded; three epurals (epaxial basalia) and two uroneurals. Post-temporal forked, attached to the epiotic and opisthotic; usually two post-cleithra on each side; no mesocoracoid; pectoral radials four, hourglass-shaped, only the lowest in contact with the hypocoracoid. Air-bladder without pneumatic duct *. Anterior rays of vertical fins spinous; pelvic fins thoracic or subabdominal, with or without spine and with from 3 to 13 soft rays; caudal fin typically with 19 principal rays, 17 of which are branched (18, with 16 branched, in the Polymixiidæ).

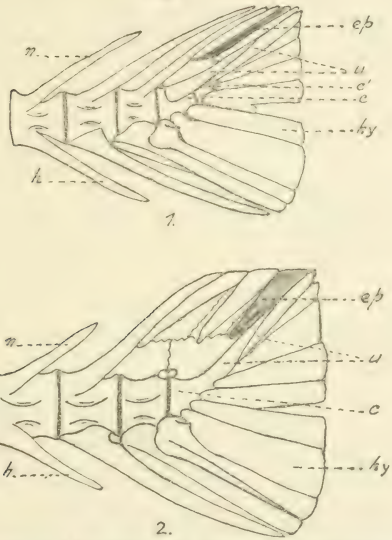
Family 1. Polymixiidæ.

Dorsal and anal fins long or moderately elongate, with a few graduated spines and rather numerous soft rays; caudal

* I cannot find a duct in any of the genera I have examined, including *Beryx* and *Holocentrus*, which are said to be physostomous.

with 16 branched rays; pelvics subabdominal, 7 or 8 rayed, without spine. Jaws with villiform teeth in bands; teeth on parasphenoid, vomer, palatines, pterygoids, and mesopterygoids. A pair of hyoid barbels. Upper edge of maxillary slipping under the præorbital and anterior suborbitals; two supramaxillaries, the posterior not overlapping the anterior; all the suborbitals forming a subocular shelf; nasals moderately large, separated in front by the præmaxillary

Fig. 1.



Skeleton of caudal fin of *Polymixia nobilis* (1) and *Hoplopteryx affinis* (2).

n, neural spine; *h*, hæmal spine; *ep*, epaxial basalia (epurals); *u*, uroneurals; *hy*, hypurals; *c*, *c'*, centra.

processes and behind by the ethmoid, to which they are united by suture; supraoccipital and parietals not overlapped by the frontals, with prominent crests; occipital crest extending to anterior edge of frontals; alisphenoids separate, bridged by the orbitosphenoid. Hypocoracoids narrowed forwards below; pelvic bones remote from the cleithra. Vertebræ 28–34; last two centra upturned and anterior uroneural united with the penultimate centrum by suture.

In addition to the recent *Polymixia*, Lowe, the Cretaceous *Platycormus*, W. von der Marck, may be placed in this family; it has been well described and figured, and shows many important resemblances to the recent genus. The less satisfactorily known *Omosoma*, Costa, and *Pycnosterinx*, Heck., may be provisionally associated with *Platycormus*.

Family 2. Berycopsidæ.

Berycopsis elegans, Dixon, from the Chalk of Sussex and Kent, has been fully described and figured by Dr. Smith Woodward. It is in some respects intermediate between the Polymixiidæ and Berycidæ, but is well distinguished from both.

Dorsal and anal fins as in the Polymixiidæ; pelvic fins not well known, perhaps as in the Polymixiidæ; two supramaxillaries formed as in *Beryx*, the posterior large and sending forward a pointed process above the anterior; pterygoid teeth present; occipital and parietal crests terminating above the middle of the orbit; suborbitals narrow, præorbital deep, and maxillary exposed; vertebræ at least 26 and perhaps as many as 30.

Family 3. Berycidæ.

Dorsal and anal with a few graduated spines; caudal with 17 branched rays; pelvics thoracic, of a spine and 7 to 13 soft rays. Jaws with villiform teeth in bands; teeth on vomer and palatines. Upper edge of maxillary slipping under præorbital and anterior suborbitals; two supramaxillaries, the posterior sending forward a pointed process above the anterior; subocular shelf formed by several suborbitals, or at least extending the whole length of the second; nasals moderately large, separated by the præmaxillary processes, but nearly meeting above them anteriorly; supraoccipital and parietals not overlapped by the frontals, with prominent crests which extend forward on the latter to the interorbital region; frontals anteriorly with prominent ridges bordering mucus cavities; alisphenoids united by suture. Hypocoracoids not narrowed forward, reaching the ventral profile and forming a symphysis behind that of the cleithra; pelvic bones embraced by the hypocoracoids and attached to the cleithra above the symphysis. Vertebræ 24; no upturned centra, and the anterior uroneural ankylosed with the last centrum.

There are two very distinct genera, viz., *Beryx*, Cuv., and *Hoplopteryx*, Agass. The former, with species from the

North Atlantic and Japan, has the dorsal, with IV 13–19 rays, much shorter than the anal, which has III–IV 26–30; the pelvics have I 10–13 rays. The latter includes three recent species from South Australia and New Zealand, in which the dorsal, with VI–VII 12–14 rays, is longer than the anal, which has IV 12–15, whilst the pelvics have I 7 rays. Moreover, the spines are stouter than in *Beryx*, and the scales are larger and structurally different, being slightly rugose with strongly pectinated edges, instead of covered with little spines. There are several Cretaceous species of *Hoplopteryx*; in the Australian *H. affinis*, Günth., the crests and ridges on the head are arranged exactly as in the Cretaceous *H. lewisiensis* described and figured by Dr. Smith Woodward. I give a figure of *H. affinis*, for comparison with the extinct forms (Pl. I.).

Family 4. **Diretmidæ.**

The type of *Diretmus argenteus*, Johnson, is in the British Museum collection; it is evidently related to the Berycidæ. The dorsal and anal fins appear to be formed mainly of articulated rays, and probably not more than 3 or 4 are spinous; the caudal has 17 branched rays; each pelvic fin is composed of a laminar, oblong ovate, obliquely striated spine and 5 branched rays; (the pelvic spine of *Beryx* is obliquely striated). The scales are small, adherent, spinulose, differing from those of *Beryx* in that the bases of the spinules are expanded into parallel vertical ridges.

The jaws have narrow bands of villiform teeth, with a series of larger pointed teeth in the lower; the palate is toothless.

The single large supramaxillary has the form of the posterior supramaxillary of the Berycidæ; the nasals are separated by the præmaxillary processes; the subocular shelf and the alisphenoids and orbitosphenoids are as in the Berycidæ. The cranial crests and ridges are as in the Berycidæ, except that the paired ridges which converge forward from the parietal crests in the latter are now united to form a single median ridge, owing to the narrowness of the interorbital region. The thin-walled auditory bulla containing a large otolith can be seen above the gills. The pelvic bones are embraced by the enormously expanded hypocoracoids, which meet in a long symphysis; this is an exaggeration of the Berycid condition.

Family 5. **Trachichthyidæ.**

Dorsal and anal spines few; pelvic fins thoracic, of a spine and 6 soft rays. Jaws and dentition as in the Berycidæ, but

vomerine teeth sometimes absent and anterior supramaxillary wanting; a single large supramaxillary, superiorly sending forward a pointed process; subocular shelf a small or slender process of the second suborbital; nasals very large, united by suture throughout their length, covering the ethmoid and the præmaxillary processes. Frontals, parietals, and supra-occipital, with their ridges and crests, arranged much as in the Berycidæ. Alisphenoids separate, bridged by the orbito-sphenoid. Hypocoracoids narrowed forward below, not reaching the ventral profile, not embracing the pelvic bones, which are firmly attached to the cleithra above the symphysis. 26 vertebræ; no upturned centra, and the anterior uroneural ankylosed with the last centrum. Abdomen with a median series of ridged or serrated scales.

Recent genera are *Trachichthys*, Shaw, *Hoplostethus*, Cuv. & Val., *Paratrachichthys*, Waite, and *Gephyroberyx*, Bouleng. The Cretaceous *Aipichthys*, Steind., and *Acrogaster*, Agass., may be provisionally referred to this family. *Sphenocephalus*, Agass., shows some resemblance to *Trachichthys*, but does not seem to have the abdominal series of ridged scales.

Family 6. **Monocentridæ.**

Differs from the preceding only in the large, bony, rigidly united scales, the absence of the first four ribs, and the reduction of the pelvic fin to a spine and 3 soft rays. The trunk-muscles are inserted only on the posterior surface of the skull, and on the upper surface the occipital and parietal crests are converted into ridges bordering mucous channels.

One genus, *Monocentris*, Bl. Schn.

Family 7. **Anomalopidæ.**

Differs from the Trachichthyidæ in the absence of mucous channels on the head and in the presence of a peculiar evertible subocular luminous organ.

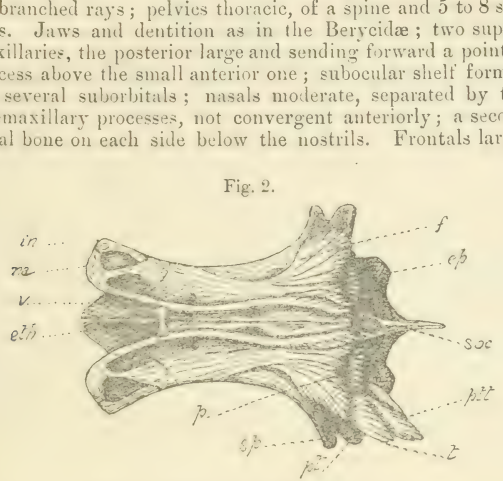
There is a single example of *Anomalops katoptron*, Bleek., in the British Museum, and I have ascertained that the nasal bones, the orbitosphenoid, and the supramaxillary are as in the Trachichthyidæ. There is a median abdominal series of ridged scales and the caudal fin has 17 branched rays. In this specimen the right pelvic fin is absent and the left has only 4 rays; these fins are said to be normally 6-rayed, but authors disagree as to whether the outer ray is spinous or articulated. *Protoblepharon palpebratus*, Bodd., which has been figured by Max Weber ('Siboga' Exped. p. 109, 1902)

seems to have I 6 pelvic rays, and is otherwise very similar to *Hoplostethus* or *Trachichthys*.

Family 8. **Holocentridæ.**

A long spinous dorsal; anal with 4 spines; caudal with 17 branched rays; pelvics thoracic, of a spine and 5 to 8 soft rays. Jaws and dentition as in the Berycidæ; two supra-maxillaries, the posterior large and sending forward a pointed process above the small anterior one; subocular shelf formed by several suborbitals; nasals moderate, separated by the præmaxillary processes, not convergent anteriorly; a second nasal bone on each side below the nostrils. Frontals large,

Fig. 2.



Skull of *Myripristis murdjan*, from above.

in, infra-nasal; *na*, nasal; *v*, vomer; *eth*, ethmoid; *soc*, supra-occipital; *f*, frontal; *p*, parietal; *sp*, sphenotic (post-frontal); *pt*, pterotic (supra-temporal); *ep*, epiotic; *t*, temporal plate; *ptt*, post-temporal.

overlapping the parietals and supra-occipital, which scarcely appear on the dorsal surface of the cranium; no parietal crests; occipital crest not extending on to the frontals, which have a pair of low longitudinal ridges bordering a median groove or channel, and posteriorly a varying number of ridges radiating backwards; trunk-muscles inserted only on posterior surface of skull, excavating large posterior temporal fossæ, which are roofed by the frontals. Hypocoracoids narrowed forward below, not reaching the ventral profile, not embracing the pelvic bones, which are loosely attached by ligament above the symphysis of the cleithra. Vertebræ 26 or 27; no upturned centra, and the anterior uroneural ankylosed with the last centrum.

Recent genera are *Adioryx*, Starks ('Science,' xxviii. 1908, p. 614), *Holocentrus*, Scopoli, *Myripristis*, Cuv. (with toothed maxillary), and *Ostichthys*, Langsdorff. The Cretaceous *Homonotus*, Dixon, seems to be near *Myripristis*; the fish described by Dr. Smith Woodward from the Chalk of Kent under the name *Trachithyioides ornatus* is known only from the skull, which is very similar to that of some recent species of *Myripristis*, although none of them show the principal frontal ridges quite so far apart posteriorly nor the radiating ridges so few. *Dinopteryx*, A. S. Woodward, with seven anal spines, may be provisionally placed in this family.

I propose the new generic name *Caproberyx* for the fish from the Chalk of Kent described by Dr. Smith Woodward under the name *Berycopsis major* (Palæontogr. Soc. 1902, p. 11, pl. ii. fig. 2). Of the vertical fins only the anal spines are known, but the head and pectoral arch are well preserved and indicate relationship to the Holocentridæ. In the short præmaxillary processes and the absence of a præopercular spine *Caproberyx* resembles *Myripristis*, in the expanded præorbital and the weak principal and numerous radiating frontal ridges *Holocentrus*. But it differs from both in the greater prominence of the occipital crest, which has the upper edge thickened and longitudinally ridged; in this and in some other features it shows considerable similarity to *Antigonia*, and it may be that this resemblance is due to real affinity and that *Caproberyx* is nearest of all the Berycoids to the Zeomorphi.

The Berycomorphi as above restricted do not include the Stephanoberycidæ and Melamphaidæ. These are probably derived from the same stock as the Berycomorphous fishes, resembling them in the structure of the protractile mouth, and in the caudal fin, which has 19 principal rays, 17 of which are branched, and the procurrent rays spinous. Not much importance can be attached to the presence of large mucous cavities on the head. They differ from typical Berycomorphi in the toothless palate, the absence of a subocular shelf, and the triangular shape of the single supramaxillary, but especially in the absence of an orbitosphenoid. I find that in both *Melamphaes* and *Stephanoberyx* the widely separated alisphenoids extend well forward between the orbits, but do not seem to be bridged by an orbitosphenoid *.

* I have had no skeletons for examination, and in these two genera, as in *Anomalops* and *Diretmus*, I have only been able to see the arrangement of the interorbital bones by a temporary displacement of one eye in a spirit-specimen.

I therefore propose provisionally to associate these fishes in a new order, which may be termed

XENOBERYCES.

The two families may be thus defined :—

1. Stephanoberycidæ.

Air-bladder with a pneumatic duct ; dorsal and anal fins without spines ; pelvics abdominal or subabdominal, without spine, 5- or 6-rayed. $3\frac{1}{2}$ gills. Nasal bones joined throughout their length.

Two genera :—*Stephanoberyx*, Gill, and *Malacosarcus*, Günth.

2. Melamphaidæ.

Dorsal and anal fins with a few slender graduated spines ; pelvics thoracic, of a slender spine and 6 to 9 soft rays ; pelvic bones well behind the cleithra. 4 gills. Nasal bones separate.

Principal genera :—*Melamphaes*, Günth., *Plectromus*, Gill, *Scopelogadus*, Vaill., *Anoplogaster*, Günth., and *Caulolepis*, Gill.

EXPLANATION OF PLATE I.

Hoplopteryx affinis, Günth. ($\times \frac{1}{2}$.)

II.—*The Collections of William John Burchell, D.C.L., in the Hope Department, Oxford University Museum.*

IV. *On the Lepidoptera Rhopalocera collected by W. J. Burchell in Brazil*, 1825–1830. By E. G. JOSEPH, of Lincoln College, Oxford.

[Continued from ser. 8, vol. v. p. 346.]

VIII. *Acræinæ.*

THE following paper contains an account of the Acræinæ that were captured by Burchell in Brazil. According to the interpretation at which I have arrived in consultation with Professor Poulton, F.R.S., and Mr. W. J. Kaye, *Actinote*

thalia, Linn., is the only representative of this subfamily that finds a place in Burchell's collection. The individuals of that species, however, exhibit a very large amount of variation both as regards size and pattern.

We believe that none of the above-mentioned variations are of specific value, although a fair proportion of the specimens answers very well to Godman and Salvin's description of *A. anteas*, Doubl. & Hew.[1], and a few others possess the rectangularly bent median black bar of the hind wing that forms so conspicuous a feature of *A. pellenea*, Hübn. But seeing that a careful examination of Burchell's material shows every intermediate grade between the patterns of *A. thalia* and *A. anteas* on the one hand, and of *A. thalia* and *A. pellenea*-like specimens on the other,—considering, furthermore, that the whole series was captured in S.E. Brazil,—we conclude that, as far as this collection, at any rate, is concerned, the above-mentioned differences are only of varietal value. It is important, however, to confirm this opinion by examination of structural characters in fresher and more perfect specimens than those of the Burchell collection, by the records of individuals observed *in coitu*, and, above all, by the paramount test of breeding.

I have, moreover, studied the descriptions and drawings of these three species by recent and older writers, and, after carefully comparing them with Burchell's specimens, have been unable to find any permanent characters by which *A. thalia*, *A. anteas*, and *A. pellenea* may be separated—a conclusion already arrived at, as regards the two first-named forms, by Godman and Salvin, Staudinger, and other authorities. Attention will be directed to any marked variations that appear in the series, under the respective numbers. It gives me much pleasure to acknowledge the kind help rendered by Mr. Harry Eltringham, M.A., of New College, Oxford, in the endeavour to ascertain the correct sex of the Burchell specimens—many of them in a very dilapidated condition.

The whole of the geographical data and other notes bearing on the scene of Burchell's botanical and entomological operations in Brazil has now been transcribed by Professor Poulton from the Catalogue of Brazilian Plants, containing the numbers 701–10108, and has been utilized for the purpose of this paper. It is a record of nearly five years' continuous

[1] 'Biologia Centrali-Americana,' Insecta, Lepidoptera Rhopalocera, vol. i. p. 141 (1879–1901).

labour, viz. from July 18th, 1825, when Burchell first landed at Rio de Janeiro, until Feb. 10, 1830, when he left Pará[1].

Westwood's list of Burchell's "*Acræa* &c." consists of twenty-two numbers, of which only three—A. 8, A. 9, and A. 10—refer to the Acræinæ as now understood. The numbers and data were written under his direction by a clerk, while "*Acræa* sp.," together with notes descriptive of individual varieties, were inserted by Westwood himself. He also wrote a supplementary and more complete catalogue of the data of A. 8, A. 9, and A. 10 on a separate slip of paper, but a single date, correctly recorded by the clerk, is omitted from the slip—a remarkable error, considering that Westwood was the writer. E. G. Joseph.

Oxford, May 11th, 1910.

Actinote thalia, Linn.

Bz. 326. I. [14. 10. 25.] ♂ = **1443.** Minas Geraes. "*Papilio.*" (As **1357.**)

The inner marginal spots of the fore wing are both distinct in this specimen, the upper, as usual, being considerably smaller than the lower. A fuller account of this character is given under **1444.**

The wings of this specimen are unusually broad and rounded,—more so than in normal males and females. They are also far more translucent than those of the typical male of *thalia*, thus approaching the characteristic appearance of the female. In size the specimen is intermediate between the small male and large female of this species. An examination of the genitalia and of the fore legs nevertheless shows clearly that the specimen is a male, although an unusual form of this sex. The rounded character of the hind wings is also evident in the rectangulated band of their under surface. (For a description of this band see under **1444.**) It would be very interesting to endeavour to ascertain by breeding whether this is a well-marked form of male or one that is transitional into the normal *A. thalia* of S.E. Brazil. Two other similar specimens (**1449** and **1453**) were captured by Burchell in Minas Geraes between 14. 10. 25 and 10. 11. 25.

Bz. 353. I. [15. 10. 25.] ♂ = **1444.** Minas Geraes. "*P*[*apilio*]." (As **1358.**)

The spot within the anal angle of the fore wing upper

[1] Burchell's last day of collecting on a large scale was Feb. 1st, 1830, but four additional plants beyond 10108 were collected on Feb. 7th and one on Feb. 8th.

surface and the smaller inner marginal spot immediately above it, recognized by Staudinger as characteristic of the *anteas* form of *thalia*, will be referred to below as the "upper and lower inner marginal spots" respectively. Their presence, however faintly indicated, will be noted in each specimen under the corresponding number, and it will be seen that Staudinger was quite correct in maintaining that this character is not of specific value. It will be found that the Burchell series presents every gradation between a condition in which the two spots are distinct to that in which a few scattered scales mark the site of the lower spot. The latter specimens, of course, are transitional into those that show no visible trace of the marking.

Another very variable character is the somewhat irregular, generally narrow, and rectangularly bent fuscous band crossing the under surface of the hind wing a little beyond the cell. In its most typical form this band originates from about the centre of the costa, and runs obliquely towards the apex of the cell, but does not enter it: opposite the apex it turns abruptly at right angles towards the inner margin and terminates at the radial streak between the second and first median nervules. The distal ends of the internervular rays nearest the costal margin are sometimes much thickened, producing the appearance of a second, much broader band, which often fuses with the above-mentioned rectangulated band, forming a broad, irregular, and ill-defined fuscous patch. Every gradation exists between such a widespread marking and a band that is narrow, well-defined, and sharply bent. The rectangulated band is sometimes reproduced, to a variable extent, upon the upper surface of the hind wing, giving to the most strongly marked individuals, viz. **1462** and **1463**, a *pellenea*-like aspect: the extent to which it is developed will be noted in all specimens that possess it; and it will be seen that the Burchell material exhibits every intermediate grade between a well-defined broadish band and a mere thickening at the distal ends of a few of the internervular rays.

Both inner marginal spots of the fore wing are distinct in this specimen, the lower, as usual, being considerably larger than the upper. The rectangulated band on the upper surface of the hind wing is very faintly indicated.

Bz. 360. I. [15. 10. 25.] ♂ = **1445**. Minas Geraes. *Pap-*[*ilio*]. (As **1358**.)

Opposite "360" Burchell wrote "(326)," thus indicating

his conclusion that both numbers were affixed to specimens of the same species.

Inner marginal spots small. Upper surface rectangulated band very sharply defined, and more distinct on its inner border, than is the similar marking on the under surface of the wing. This specimen is placed under A. 9 of Westwood's list (see p. 18), characterized by the band above described.

Bz. 477. I. [16. 10. 25.] ♂ = **1446.** Minas Geraes. "*Papilio.*" (See **1357.**)

Opposite "477" Burchell wrote ("353"), thus showing that he considered both numbers to be affixed to specimens of the same species.

Lower inner marginal spot very small: upper represented by a few scattered scales. Very faint indications of the upper surface rectangulated band appear between the second subcostal nervule and the radial nervure, between the latter and the third median nervule, and between the second and first median nervules.

854. I. 24. 10. 25. ♂?= **1447.** Minas Geraes. "*Pap*[*ilio*]." (As **1360.**)

This specimen bears a female body, and as regards size approaches the normal *A. thalia* female, but its general aspect is so male-like in the opacity of the wings that it seems probable that we are dealing with an unusually large male to which a female body has accidentally been attached. It may here be mentioned that in determining the sex of the Burchell material, we have been obliged to resort to such superficial characters as the opacity of the wings or the size of the specimen, when the abdomen and fore legs are wanting.

Lower inner marginal spot very small: upper represented by a single scale on each fore wing. Upper surface rectangulated band fairly well marked at its origin, but just before reaching the first subcostal nervule it becomes much fainter and terminates at the second subcostal.

905. II. 25. 10. 25. 2 ♂ = **1448, 1449.** Minas Geraes. "*P*[*apilio*]. At Discoberto, near João Pedro's house." (See **1284.**)

It is to be noted that of these two males, taken on the same day, **1448** is the normal form of the species, while **1449** is a round-winged individual similar to **1443.**

Both spots distinct in **1448**; and upper surface rectangulated band of this specimen very faintly indicated, as in **1444.** The other ♂ (**1449**) agrees with **1443** in all essential respects.

906. I. 25. 10. 25. ♂ = **1450.** Minas Geraes. "*P*[*apilio*]." (As **1448.**)

Westwood's "Catal. A. 8" (clerk's MSS.) is on specimen. Westwood's list agrees with this label.

4. 11. 25. ♂ = **1451.** Minas Geraes. "At Francisco Manoel's." "Some tropeiros from the rancho seeing me catching *Papilionidæ*, caught a few also for me. I afterwards ascended the hill into the forest northward of our Rancho and took insects, till wet through in a thunder shower. In the evening caught some insects by the candle." (See **1285.**)

10. 11. 25. 2 ♂ = **1452, 1453.** Minas Geraes. Burchell's Cat. pl. Braz.' states that he was "Between Mórro Grande & Soumidoúro." * On this day Burchell also speaks of the "Serra do Soumidouro," "in montibus Soumidouro," and the "*Serra do Corrego secco* more elevated than Serra Estrella"; also "Morro Taquari" and "Rancho of Soumidouro," where he "arr[ived]" at "3.55 P.[M.]." *

On this day, as on 25. 10. 25, Burchell captured a normal male (**1452**) as well as a round-winged form (**1453**) similar to **1443.**

The upper surface rectangulated band of **1452** is here and there indicated by a few scales scattered between the veins. The other ♂ (**1453**) agrees with **1443** in all essential respects, save in the absence of the upper spot from fore wing.

29. 12. 25. ♂ = **1454.** Rio de Janeiro. (As **1370.**)

Upper surface rectangulated band as in **1444.**

31. 12. 25. 2 ♀ = **1455, 1456.** Rio de Janeiro. "On the Corcovádo Mountain, and in the Valley of Laranjeiras." "Excursion to the summit of the Corcovado; from Catete & up the valley of Laranjeiros." "On the Corcovádo Mountain by the way of Laranjeiras commencing at the summit, at the Flagstaff." *

Both spots distinct in **1456.**

22. 3. 26. b. ♂ = **1457.** Rio de Janeiro. (As **1411.**)

9. 12. 26. 2 ♀ = **1458, 1459.** Cubatão. "At Rio das Pédras; in the Forest." "Near Cubatão, (at Rio-das-Pédras) (In M[r] Smith's Cítio, & immediate vicinity) 8–10 December 1826." * On Dec. 9th he was collecting plants "In Sylva." *

Faint trace of lower spot on right fore wing of **1458**: left fore wing much rubbed. Lower spot distinct on both wings of **1459.**

[1] Passages extracted from the Cat. pl. Braz. are always indicated by an asterisk, thus *.

14. 12. 26. ♀ = **1460.** Cubatão. No mention is made of this date in any of Burchell's records. But on Dec. 13th we find, both in the Cat. Geog. and in the Cat. pl. Braz., that he was on the lower slopes of the Serra de Cubatão; while on Dec. 15th the same two Catalogues state that he was at Rio das Pédras: hence it is probable that he was back again at Rio das Pédras on Dec. 14th, perhaps engaged in arranging his botanical and zoological collections.

Westwood's "Catal. A. 9" is on specimen, and his list agrees with this label.

It is very difficult to determine, from the nature of the paper, whether the label borne by this specimen is English or Brazilian: for though it has the whitish colour, it does not exhibit the signs of age of the latter type of paper. Inasmuch, however, as it is a little larger than the average Brazilian label, it seems probable that it is made of a different type of English paper from that ordinarily employed by Burchell—most of the English labels having been written on paper of a greyish tint. The same difficulty has been experienced with regard to the labels on **1458**, **1459**, **1462**, and **1471**. The two former, however, being a great deal larger than the ordinary Brazilian label, are almost certainly English, while the others are probably also English, for the same reasons that were stated for **1460**.

Both spots are distinct, the lower being subtriangular, with its apex directed towards the base of the wing. It is interesting to note that the lower spot takes this form in all the Burchell specimens that possess a well-marked rectangulated band on the upper surface. Moreover, Hübner clearly represents this feature as well as a portion of the band in his figure of *A. pellenea* in the 'Zuträge zur exotischer Schmetterlinge'[1]. The degree of triangularity varies greatly in *pellenea*-like as well as in other specimens, and in a large number of cases the spot loses the triangular shape altogether, and becomes rectangular or ovoid &c. I conclude, therefore, that this character is of no more value in separating *A. pellenea* from *A. thalia* than is the upper surface band. All distinctions founded on pattern alone seem to break down; and if *pellenea* be really separate from *thalia*, the evidence must rest on structural characters as yet insufficiently investigated, or on the results of breeding.

The upper surface rectangulated band is only faintly indicated, but as the hind wing is almost totally denuded of

[1] Figure 741 in the 'Zuträge zur Sammlung exotischer Schmetterlinge,' by J. Hübner and C. Geyer (Augsburg, 1818–1837).

scales, and in view of the triangular condition of the lower spot above described, it seems possible that this band was formerly well developed.

Westwood also refers to this band in his list. (See **1471.**)

Bz. 17. 12. 26. ♀ = **1461.** Cubatão. No mention is made of Burchell's whereabouts on this date in any of his records: but according to the Cat. pl. Braz. he was "In the middle part (about ⅔) of the Ascent up the Serra de Cubatão"* on Dec. 16th, and he is not reported to have made any further expedition till Dec. 22nd; so it is probable that he spent the days between Dec. 16th and Dec. 22nd at Rio das Pédras, and may have been engaged upon his botanical and zoological collections.

The following evidence supports the conclusion that he was in this locality on one of these days. It is noted in the Cat. pl. Braz. that "3628–4" (a botanical specimen) was collected "19. 12. 26"[1]. Now 3595–3628 are the botanical entries for Dec. 15 at Rio das Pédras, and the fact that the last of these entries was repeated (with the addition of "—4") for the above-mentioned specimen, suggests that it came from the same locality as 3628, *i. e.* that Burchell was at Rio das Pédras on 19. 12. 26. If this conclusion be correct, it is probable that 17. 12. 26 was also spent in the same locality.

Westwood's list records one other specimen of this date.

Inner marginal spots as in **1460.** Detached sections of the upper surface rectangulated band distinctly shown, and as this specimen is much rubbed, it is possible for the reasons given under **1460** that in its original state the band was continuous and well marked. It is worth noticing that the ray that runs between the first and second median nervules traverses and projects a little beyond one of the detached segments of the upper surface band. It is slightly thickened at the point of intersection, but gradually tapers at its distal end, thus creating the impression of a barbed arrow-head.

18. 12. 26. ♂ = **1462.** Cubatão. Burchell was probably at Rio das Pédras on this day. (See **1461.**)[2]

Inner marginal spots as in **1460**, but a great deal smaller. Upper surface band extremely well marked and broad, forming the ground on which Westwood placed this specimen and **1462** under A. 10 in his list (see p. 18).

This specimen and **1463**, both males and both taken on the same day, had been named *pellenea* after comparison with specimens in the Godman-Salvin Collection, and so far as

[1] 3628–2 and 3628–3, collected "in horto" and undated, are probably to be understood as 15. 12. 26.

[2] See also note on **1460.**

pattern alone can supply evidence they certainly belong to this form. It has been, however, pointed out on p. 10 that the pattern of *pellenea* is transitional into that of *thalia* and that we are not justified in considering them specifically distinct until stronger evidence has been produced. Burchell's specimens do, however, furnish indications of the local development of a *pellenea*-like appearance in the S. Paulo and Cubatão district. Only a single specimen with a well-marked rectangulated band on the hind wing upper surface was taken in any other area, viz. **1445**, from Minas Geraes. The most *pellenea*-like males are **1462** and **1463**. A corresponding female is to be found in **1467** and, allowing for its worn condition, probably in **1460** also. This character is exhibited, but in a less degree, by **1445** and **1465**, both males, and slight indications of it appear in **1461**, a female, and **1466**, a male.

Bz. 18. 12. 26. ♂ = **1463**. Cubatão. (See **1461**.)

Westwood's "Catal. A. 10" is on specimen. Westwood's list agrees with this label.

Inner marginal spots and upper surface band as in **1462**.

Bz. 24. 12. 26. ♀ = **1464**. Cubatão. "About Rio das Pédras and Cubatão." *

Both spots distinct.

Bz. 1. 4. 27. ♂ = **1465**. "At S. Paulo. On the Santos road, as far as the church of N. S. da Gloria." *

This specimen is exceptionally dark, and all the yellow markings of the fore wing upper surface are greatly reduced, the basal patch and the spot between the first and second median nervules being merely represented by a few scattered yellow scales. The ferrugineous ground-colour of the hind wing is unusually dark, while the black radiate nervular and internervular markings are exceptionally developed, thus contributing to the general dusky appearance of the upper surface. The upper surface band is very distinct, but comparatively narrow, a character recognized by Westwood when he classified this specimen under A. 9 in his list (see p. 18).

13. 4. 27. ♂ = **1466**. Near S. Paulo.

Upper marginal spots on right fore wing similar to those on **1462**, but less developed: left fore wing rubbed. Upper surface band distinct, but very narrow. The specimen is placed under A. 9 of Westwood's list (see p. 18).

9. 5. 27. ♀ = **1467**. S. Paulo. "Near the Convénto da Luz." "Between Tanque do Zunica & the Luz Convent." *

Inner marginal spots as in **1460**. Upper surface band very distinct and rather broad. This specimen seems as nearly as possible to present the same condition as **1462** and

1463, allowing for the greater size and translucency of a female. The ground-colour of the hind wing is peculiar, being of a very pale yellow passing into a ferrugineous submarginal band. The usual nervular and internervular radiate markings cut into the black marginal and the ferrugineous submarginal bands, as well as the central yellow area. The strongly marked rectangulated band was recognized by Westwood when he placed **1467** under A. 10 in his list (see below).

26. 10. 27. ♀ = **1468**. Between Meiaponte and Goyaz. "S. Joaquim." "At the Engénho de [blank] S. Joaquim," * Oct. 25–7, 1827.

Submarginal spots very slightly developed.

Bz.+ 26. 10. 27. ♀ = **1469**. Between Meiaponte and Goyaz. "S. Joaquim." (As **1468**.)

Lower spot distinct, upper absent.

5. 3. 28. ♂ = **1470**. Goyaz. "Caught by the rio Vermelho, near the Carioca aqueduct, by C[ongo]." Congo was the name of Burchell's native servant.

Lower spot well developed, upper absent. Upper surface band faintly indicated as in **1444**.

29. 4. 28. ♀ = **1471**. Goyaz. [1]

Lower spot distinct, upper absent.

Besides the addition alluded to under **1461**, Westwood's list gives two further specimens, one being caught on 13. 3. 26 at Rio de Janeiro, the other on 16. 11. 26 at Santos. The data of this species not only appear as A. 8, A. 9, and A. 10 in Westwood's "*Acræa* &c.," but also separately on a small slip of paper. The first of these lists is in a clerk's handwriting and is not quite so complete as the second, though it correctly records two specimens of the date 18. 12. 26, while only one such specimen is mentioned in the other list.

Most of the specimens of this species are included under the number A. 8 of the first list, and Westwood wrote opposite to it "*Acraea* sp." A. 9, however, refers to four specimens bearing the data 360 (**1445**), 14. 12, 26 (**1460**), 1. 4. 27 (**1465**), 13. 4. 27 (**1466**); opposite to these he wrote "var. d° [*i. e.* of *Acræa* sp.] with narrow band across h[ind] w[ing]." Finally A. 10 refers to three individuals with the following dates:—two with 18. 12. 26 (**1462** and **1463**), and 9. 5. 27 (**1467**). These he describes as "var. d° [*i. e.* of A. 8] with band across h[ind] w[ing], broader."

The second list, which is altogether in Westwood's handwriting, bears the heading "*Acraea Thalia*."

In both lists **1447**–**1450** are recorded with their dates as well as with their numbers.

[1] See also note on **1460**.

III.—*Descriptions of new Reptiles from the Andes of South America, preserved in the British Museum.* By G. A. Boulenger, F.R.S.

(Published by permission of the Trustees of the British Museum.)

Hemidactylus leightoni.

Snout obtuse, longer than the distance between the eye and the ear-opening, about once and a half the diameter of the orbit; forehead concave; ear-opening oval, more than half diameter of eye. Body and limbs moderate. Digits rather short, free, inner well developed; 5 lamellæ under the first toe, 7 under the fourth. Snout granular, the granules much larger on the sides of the frontal concavity; back of head with minute granules intermixed with round tubercles; rostral completely divided into two by a median cleft; nostril bordered by five small scales; 9 or 10 upper and 8 or 9 lower labials; symphysial triangular, embraced by a pair of rather large chin-shields forming a median suture behind it; a smaller chin-shield on each side of the median pair. Upper parts of body granular, with numerous large trihedral, strongly keeled tubercles, smaller than the interspaces between them, disposed in oblique transverse series; ventral scales smooth, roundish, imbricate, about 40 across the middle of the belly. Tail slightly depressed, with transverse rows of enlarged pointed tubercles above, with a series of transversely enlarged plates below. Pale greyish above, with small dark brown spots and dots; a rather indistinct dark streak on each side of the head, passing through the eye; lower parts white.

	mm.
Total length	125
Head	18
Width of head	13
Body	42
Fore limb	20
Hind limb	26
Tail	65

A single female specimen taken at Honda, Magdalene R., Colombia, 300–400 feet, by Sir Bryan Leighton and presented by him to the British Museum.

Anolis boettgeri.

Head twice as long as broad, as long as or slightly longer than the tibia; forehead concave; no frontal ridges; upper head-scales rugose and more or less distinctly keeled; scales

of the supraorbital semicircles strongly enlarged, in contact with each other on the median line and with the occipital; several enlarged, keeled, supraocular scales, in contact with the supraorbitals, or separated from them by a series of granules; occipital as large as the ear-opening; canthus rostralis angular, central scales five or six; loreal rows five or six; six to eight upper labials to below the centre of the eye; ear-opening large, oval. Body scarcely compressed; no crest. Dorsal scales very small, juxtaposed, keeled, scales of flanks smaller still, granular; ventrals much larger than dorsals, smooth. The adpressed hind limb reaches the eye, or between the ear and the eye; digits rather feebly dilated; 18 or 19 lamellæ under phalanges II and III of the fourth toe. Tail roundish, covered with uniform keeled scales, which are larger beneath. Greyish or olive, with six or seven angular dark cross-bars on the back, the chevrons pointing forwards, or with a broad yellow or orange vertebral stripe; limbs with dark cross-bars; yellowish white beneath, with scattered greyish spots, usually more numerous on the throat.

	mm.
Total length	230
Head	18
Width of head	9
Body	50
Fore limb	29
Hind limb	50
Tibia	16
Tail	162

Four female specimens from Huancabamba, E. Peru, above 3000 feet, collected by Mr. Enrique Boettger.

Distinguished from its allies *A. ortonii*, Cope, and *scapularis*, Blgr., in the occipital plate being in contact with the enlarged scales of the supraorbital semicircles.

Anolis ventrimaculatus.

Head twice as long as broad, as long as the tibia; forehead deeply concave; no frontal ridges; upper head-scales small and keeled; scales of the supraorbital semicircles feebly enlarged, separated in the middle by four series of scales; no enlarged supraocular scales; occipital very small; canthus rostralis angular, canthal scales six; loreal rows eight; seven upper labials to below the centre of the eye; ear-opening large, oval. Body feebly compressed; no crest. Dorsal scales minutely granular, keeled, scarcely larger than the laterals; ventrals much larger, juxtaposed, smooth. The

adpressed hind limb reaches the tip of the snout; digits rather feebly dilated; 20 lamellæ under phalanges II and III of the fourth toe. Tail roundish, covered with uniform keeled scales, which are larger beneath. Dark purplish brown above, white, dotted and vermiculated with black beneath.

	mm.
Total length (tail reproduced)	95
Head	16
Width of head	8
Body	41
Fore limb	28
Hind limb	54
Tibia	17

A single female specimen and a very young one from the Rio San Juan, Choco, S.W. Colombia, collected by Mr. M. G. Palmer.

Allied to *A. gemmosus*, O'Sh., and *maculiventris*, Blgr.

Anolis macrolepis.

Head once and two-thirds as long as broad, as long as the tibia; forehead concave; frontal ridges feeble, short; upper head-scales very unequal in size, small and keeled on the snout, large and rugose on the occiput; scales of the supra-orbital semicircles strongly enlarged, separated in the middle by one series of very small scales, and in contact with the occipital; two or three very strongly enlarged, rugose and keeled supraocular scales; occipital very large, much larger than the ear-opening; canthus rostralis short, canthal scales two or three; loreal rows six; seven upper labials to below the centre of the eye; ear-opening moderately large, oval. Body scarcely compressed; no crest. Dorsal scales very large, flat, juxtaposed, squarish or hexagonal, feebly keeled or striated; lateral scales small, granular, keeled; ventrals also granular, keeled, much larger than laterals, much smaller than dorsals. The adpressed hind limb reaches the eye; digits feebly dilated; 15 or 16 lamellæ under phalanges II and III of the fourth toe. Tail roundish, covered with uniform keeled scales, which are larger beneath. Brown above, with more or less distinct darker angular cross-bands pointing backwards; a dark streak on each side of the head and neck, passing through the eye, followed on the body by large dark spots, below which there is a whitish longitudinal streak; hind limbs with oblique dark cross-bands; lower parts white.

	♂. mm.	♀. mm.
Total length (tail reproduced)	105	115
Head	12	15
Width of head	7	9
Body	28	40
Fore limb	17	25
Hind limb	32	47
Tibia	12	15

A female from Novita, Rio Tamaná, Choco, S.W. Colombia, 150–200 feet, and two young males from Condoto, in the same district, 150 feet, collected by Mr. M. G. Palmer.

Allied to *A. pœcilopus*, Cope, and *notopholis*, Blgr., also from Colombia.

Stenocercus boettgeri.

No pterygoid teeth. Anterior border of ear with four or five conical scales forming a denticulation. Middle supraocular scales not or but little enlarged transversely; no enlarged occipital. Sides of neck irregularly folded; a transverse fold in front of the collar, which is broadly interrupted in the middle. Body depressed; a slight dorsal denticulation or low vertebral crest. Nuchal and lateral scales very small, granular, feebly keeled; dorsal scales much larger, rhomboidal, subimbricate, strongly keeled, not mucronate, merging into the caudals, the keels forming oblique lines converging posteriorly. Gular and ventral scales rhomboidal, imbricate, smooth, the ventrals as large as or a little larger than the dorsals. The hind limb, stretched forwards, reaches the ear, or between the shoulder and the ear; fifth toe not extending as far as second. Tail once and a half to once and three-fourths as long as head and body, rounded, tapering; caudal scales large, strongly keeled, not or but very shortly mucronate, arranged in rings. Olive above, with more or less distinct darker cross-bars accompanied by transverse series of small pale greenish spots; a black band on the collar-fold; throat marbly bluish green; belly pink.

	mm.
Total length	225
Head	23
Width of head	15
Body	48
Fore limb	41
Hind limb	60
Tail	154

Several specimens from Huancabamba, Peru, collected by Mr. E. Boettger.

Very closely allied to *S. simonsii*, Blgr., but form more slender, dorsal scales more strongly keeled, and caudal scales not spinose.

Echinosaura palmeri.

Snout pointed, longer than broad; frontonasal divided into two by a longitudinal suture; one pair of elongate præfrontals, a large frontal, twice as long as broad, a pair of small frontoparietals, two supraoculars, the rest of the upper surface of the head with unequal-sized flat scales; frontonasals striated, the other head-shields smooth; nasal single, followed by a large loreal; a series of suboculars; five upper and four lower labials; an azygous chin-shield, followed by two pairs, the anterior of which is large. Dorsal scales minutely granular, with interrupted series of large keeled or conical tubercles; four series of these tubercles on the nape; numerous tubercles on the limbs. Ventral shields smooth, in 8 longitudinal and 27 transverse series. Three transverse series of anal shields. 6 femoral pores on each side. Enlarged tubercles on tail keeled, few, forming transverse series. Dark brown above, with two longitudinal series of large pale spots; belly pale brownish, spotted with black.

	mm.
Total length	147
Head	17
Width of head	10
From end of snout to fore limb	26
From end of snout to vent	62
Fore limb	18
Hind limb	27
Tail (reproduced)	85

A single male specimen from Noanamoá, Rio San Juan, Choco, S.W. Colombia, 100 feet, from the collection of Mr. G. Palmer.

Well distinguished from the type of the genus, *E. horrida*, Blgr., by the different head-shields, the absence of a double vertebral ridge, the less spine-like tubercles on the throat and body, and the smooth ventral shields.

Prionodactylus spinalis.

Snout short; body moderate. Upper head-shields smooth; frontonasal single; præfrontals forming a median suture; frontal not or but slightly longer than the frontonasal; frontoparietals smaller, much smaller than the interparietal and parietals, which are subequal or the latter the broader;

three occipitals, median smallest; postoccipitals not or but feebly enlarged; three supraoculars, the first as large as or larger than the third, with which it is sometimes in contact on the outer side of the second; nostril in a single or divided nasal; a single loreal and a freno-orbital; upper temporals large; 7 or 8 upper and 5 or 6 lower labials; chin-shields, one anterior and 3 or 4 pairs; the two first pairs forming a suture; none of the gulars strongly enlarged transversely; 9 or 10 collar-shields. Dorsal scales rather strongly keeled, narrow, elongate tetragonal or hexagonal with very obtuse angles; lateral scales very small; 38 to 45 scales, including ventrals, round the middle of the body, 39 to 46 from occiput to base of tail. Ventral plates in 12 longitudinal and 19 to 21 transverse rows; the two median plates as long as broad, the others gradually narrowing towards the sides. Two anterior and 4 to 6 posterior præanal plates. Subdigital lamellæ smooth. 7 to 10 femoral pores on each side in males, 0 to 7 in females. Caudal scales quadrangular, upper keeled, lower smooth. Olive above, usually with a lighter, black-edged vertebral band, widening towards the head, of which it occupies the upper surface; sides of males often with small black ocellar spots with white centres; belly greyish, more or less profusely spotted with black; lower surface of hind limbs and tail often red.

	♂. mm.	♀. mm.
Total length	180	166
Head	17	13
Width of head	12	9
From end of snout to fore limb	24	22
„ „ „ „ vent	70	66
Fore limb	20	18
Hind limb	24	23
Tail	110	100

Numerous specimens from Huancabamba, E. Peru, above 3000 feet, collected by Mr. E. Boettger.

This species differs from all those previously referred to the genus *Prionodactylus* in the number (12) of the longitudinal rows of ventral plates and in the shape of the dorsal scales.

Leptognathus sancti-joannis.

Body strongly compressed. Eye moderate. Rostral a little broader than deep, not visible from above; internasals half to two-thirds as long as the prefrontals; frontal as long as broad, nearly as long as its distance from the end of the snout, shorter than the parietals; nasal divided; loreal deeper

than long, separated from the eye by two superposed præoculars, below which a subocular may be present; two (rarely three) postoculars; temporals 2+2 or 3; eight or nine upper labials, fourth and fifth or fifth and sixth entering the eye; first lower labial in contact with its fellow behind the symphysial; two or three pairs of chin-shields, first a little longer than broad. Scales in 15 rows, vertebrals strongly enlarged, but not twice as broad as long. Ventrals 176–194; anal entire; subcaudals 77–101. Blackish brown, with light cross-bands or rings, which are narrow and white on the anterior part of the body and then become gradually broader and brown edged with white; first light bar across the occiput; head dark brown above, with light vermiculations and some black spots and a bar across the forehead; a broad black bar below the eye,

Total length 600 mm.; tail 140.

Several specimens from Pueblo Rico, slopes of San Juan River, Colombian Choco, 5200 feet, from the collection of Mr. G. Palmer.

IV.—*On some Freshwater Entomostraca from Egypt and the Soudan.* By Robert Gurney, M.A.

[Plate II.]

Our knowledge of the Entomostraca of the Nile Valley is exceedingly small, and the following list of species is offered as a slight contribution to its extension. The species mentioned are derived from two sources—(1) from my own collections in Upper Egypt, and (2) from small collections made by my brother, Mr. Eustace Gurney, in the White Nile and the Blue Nile near Khartoum in 1902.

My own collections were made in Egypt in the months of February, March, and April of 1907 and 1909. During these visits I examined various pools of fresh water from Luxor northwards, as well as the Nile itself near Luxor and the Birket el Kurun in the Fayûm.

My investigations were not so complete as could be wished, owing to the distraction of other interests, the Fayûm in particular deserving much more attention; but I believe they present a fairly complete picture of the Entomostracan fauna of the region at that season of the year. They show that the fauna is not very varied, and that, like the physical

features of the country, it is remarkably uniform in distribution. The long, unvaried, valley of the Nile seems, both for the fauna and the flora, to effect a transition between the Ethiopian and the Palæarctic regions, and to produce a uniformity which can rarely be met with in other parts of the world. Such a uniformity with regard to the Entomostraca is only to be expected, since all the water of the country is supplied from the same source, and the majority of the smaller pools are only temporary, drying up in the summer. Where there are permanent pools of water in which there is vegetation the fauna is more varied, but, on the whole, the species are evenly distributed.

List of Species.

(1) *Diaphanosoma brachyurum*, Liévin.

Abundant in pools by the road to the Pyramids of Gizeh, and also found in a canal at Lecht. A few males were found among the specimens taken on Feb. 15 in the former place.

(2) *Diaphanosoma excisum*, Sars.

A number of specimens of this species were found in the collections from the Blue and the White Nile. Ekman (1901) has described a variety (var. *longiremis*) from the White Nile which differs from the type in the greater length of the antennæ and the presence on the postabdomen of a few short hairs. My own specimens have the shorter antennæ of the type, but the same hairs on the postabdomen as Ekman describes.

(3) *Daphnia lumholtzi*, Sars.

A few specimens, including males and ephippial females, were taken in a pool near the Pyramids, and ephippia which I refer to this species were found in a pool at Dahchour. A single adult specimen, somewhat decayed, was found in the Nile at Luxor.

(4) *Daphnia longispina*, O. F. M.

Pools near the Pyramids, pool at Dahchour, and in the Nile at Kous.

(5) *Daphnia longispina*, var. *cucullata*, Sars.

I have a rough drawing by my brother of a species of

Daphnia from the White Nile which belongs to the *Daphnia cucullata* group, and probably represents *D. jardinei*, var. *barbata*, Weltner. As the specimen is lost I cannot be sure of its identity.

(6) *Simosa vetula*, O. F. M.

Zoological Gardens, Cairo; pools near the Pyramids; pools at Sakkara and at Tamiah (Fayûm). Common.

(7) *Ceriodaphnia reticulata*, Jur.

Pools near the Pyramids and at Dahchour. Specimens taken on March 25, 1907, in the former place bore ephippia. A few individuals possessed the toothed fornix characteristic of the variety *serrata*.

(8) *Ceriodaphnia rigaudi*, Richard.

Pool by the Pyramids, at Dahchour, and in the Blue Nile. Rare.

(9) *Ceriodaphnia dubia*, Richard.

In the Nile at Luxor and Kous.

(10) *Ceriodaphnia quadrangula*, O. F. M.

Pools by the Pyramids and at Sakkara.

(11) *Bosmina longirostris*, O. F. M.

The typical form of this species appears to be generally distributed and common in pools. The variety *cornuta* occurred in the Zoological Gardens at Cairo in February and in the Nile at Luxor and Kous in March.

(12) *Moina dubia*, Richard. (Pl. II. figs. 1, 2.)

This species appears to be the commonest plankton Cladoceran in the Nile valley. It was found abundant in Lake Victoria by Daday, and in the Nile from Omdurman to Assouan by Ekman. My own collections show that it is common in the Blue Nile and in the Nile itself from Khartoum to below Luxor.

The specimens taken in the Blue Nile in March 1902 include some males and ephippial females. The ephippium is not distinguishable from that of *Moina rectirostris*, since it has but a single egg-space surrounded by an incomplete

circle of reticulations which do not extend over the egg-space itself (Pl. II. fig. 1). The male resembles that of *M. rectirostris* in shape and in the form of the first leg and first antenna, but differs from it in having only three hooks at the end of the first antenna (fig. 2). The number of these hooks does not appear to be quite so constant a character as has been supposed, as I have shown (1909) that a form of *M. rectirostris* occurs in Tunisia in which the male has only four hooks in place of five. It appears, therefore, that the differences between the species in question and *Moina rectirostris* are:—

(1) Its small size.
(2) Small number of teeth on the postabdomen.
(3) Less pronounced comb on the postabdominal claws.
The presence or absence of transversely arranged cilia on the postabdomen has been shown by Ekman not to be distinctive.
(4) There is a slight difference between the proportions in the two species between the præanal and postanal parts of the postabdomen.

The first three of these differences seem to me to be probably accountable by the limnetic habit of the species, and the sum of the differences does not seem to amount to specific distinction.

(13) *Moina salinarum*, Gurney. (Pl. II. figs. 3, 4.)

In the plankton of the Birket el Kurun a species of *Moina* which is identical with that recently found by me in a salt lake in Tunisia, and described under the name *M. salinarum*, is abundant. There is no perceptible difference between the two, except that I cannot detect in the Egyptian specimens any cilia on the first pair of antennæ. I give a figure of the postabdomen for comparison (fig. 3). I have nothing to add to the description already given, except that the first leg of the female agrees in all respects with that of *M. rectirostris*.

No ephippial females were found, but a few males occurred in a collection made in the Lake on Feb. 20, 1909. These males do not differ in any important respect from those of *M. rectirostris*, though the head is somewhat longer and more conical and the depression above the eye is very slight. The form of the first leg is also the same. On the other hand, the shape of the postabdomen differs in the same way as does that of the female, and the first antennæ bear four hooks instead of five. In one male a distinct trace of a pigmented ocellus was seen (fig. 4).

The occurrence of this species in the Birket el Kurun seems further to justify the specific name, as it appears to be a species characteristic of water of a high salinity.

(14) *Ilyocryptus sordidus,* Liévin.

Four rather immature specimens occurred in a collection made in a canal at Lecht which runs from the Nile near El-Wasta northwards as far as the barrage below Cairo.

A much mutilated specimen of a species of *Ilyocryptus* was found in the Blue Nile, but I am unable to identify it with certainty. In the form of the postabdomen it agrees most closely with *I. longiremis,* Sars.

(15) *Camptocercus australis,* Sars.

Found in the sweet-water canal at Port Said and in pools in the Zoological Gardens at Cairo. Hitherto the species has been recorded only from the Oriental and Neotropical regions.

(16) *Alona affinis,* Leydig.

Two rather decayed specimens were found in the Nile near Luxor.

I cannot agree with Keilhack (1909) in regarding this species as a variety only of *Alona quadrangularis.* The two species differ, in my experience, not only in habit, but in quite constant structural features.

(17) *Alona rectangula,* Sars. (Pl. II. fig. 5.)

In pools by the road to the Pyramids and at Dahchour. Ekman describes specimens from Gizeh and the White Nile which he refers to *Alona bukobensis,* Weltner, but it seems to me that Daday (1907) is right in considering *A. bukobensis* as a synonym of *A. rectangula.* The form of the postabdomen in both is extremely variable and the variations in form and arrangement of the denticles evidently overlap each other. My own specimens are very few and do not show much variation; the postabdomen closely resembles that of the typical European form of the species (fig. 5).

(18) *Leydigia quadrangularis,* Leydig.

Two specimens only were found in a pool in the Zoological Gardens at Cairo.

(19) *Alonella diaphana,* King, var. *punctata,* Daday.

A few specimens identical with Daday's species *A. punctata* were taken on Feb. 12, 1907, in the sweet-water canal at Port Said. *Alonella punctata* has been recorded by Daday from Ceylon, South America, and East Africa, and it seems probable that it is not specifically distinct from *A. diaphana,* King, and *A. davidi,* Richard. Sars (1901) has already expressed his opinion that the two latter are identical; and the description given by Stingelin (1904) of specimens attributed to *A. davidi* and taken in Java and Honolulu seems to indicate that the group *diaphana-davidi* passes by intermediate forms into *punctata.* The distinction or otherwise of these forms turns upon the presence and arrangement of the cilia and teeth on the postabdomen. The dorsal margin of the postabdomen bears in the *punctata* form a series of distinct bundles of minute denticles. In *A. diaphana* and *A. davidi* these denticles seem to be generally arranged singly, though in *A. davidi* var. *iheringi* there is a tendency to arrangement in groups. In Stingelin's specimens from Java and Honolulu the denticles are almost as clearly united into groups as in the true *punctata* form.

In *A. davidi* and *A. punctata* there are always lateral groups of delicate cilia; but these are not figured by Sars, and their absence constitutes the only real difference between *A. diaphana* and *A. davidi.* I am disposed, therefore, to regard *A. punctata* and *A. davidi* as only varieties of *A. diaphana,* King.

(20) *Dunhevedia crassa,* King.

One specimen found in a pool in the Zoological Gardens at Cairo.

(21) *Chydorus sphæricus,* O. F. M.

Pools by the road to the Pyramids; Zoological Gardens; Dahchour. Ephippial females were found on Feb. 15 and March 25, 1907, and Feb. 22, 1909.

(22) *Chydorus* sp.? (Pl. II. fig. 6.)

The shell of a single decayed specimen of a species of *Chydorus* was found in a collection made in the Zoological Gardens.

The specimen appears to resemble *Chydorus globosus* very closely, but differs from it to some extent in the slight

prominence of the preanal angle, the very regularly placed postanal denticles (fig. 6), and the shorter and broader post-abdomen. The latter difference is, perhaps, attributable to immaturity, but the remains are too incomplete for satisfactory identification.

Copepoda.

(23) *Diaptomus galebi,* Barrois.

In pools in the Zoological Gardens at Cairo, at Lecht, and by the Pyramids; abundant. Also found in the Blue and the White Nile.

(24) *Diaptomus alluaudi,* De Guerne & Richard.

Pools by the road to the Pyramids, Sakkara, Lecht, Dahchour; a common species. A few specimens were also found in the Birket el Kurun, but it is evidently not common there.

(25) *Diaptomus salinus,* Daday.

Only found in the Birket el Kurun, where, with *Moina salinarum,* it forms the bulk of the plankton.

My specimens agree in almost all respects with the descriptions of Schmeil and others and with specimens from Algeria, but they differ in the shape of the last thoracic segment and the first abdominal segment of the female. The last thoracic segment is scarcely at all produced into "wings," being simply rounded behind on the left side and armed with two small spines, while on the right side it is produced into a short outwardly directed point. The first abdominal segment is very short and slightly asymmetrical, the spine on the left side being larger than that on the right. The proportional lengths of the furca and the abdominal segments are, on an average, as follows :—

	Abdominal segments.			Furca.
	1.	2.	3.	
Length.....	13	5	8	11

(26) *Cyclops leuckarti,* Claus.

Abydos, near the Pyramids, Sakkara, White Nile, and Blue Nile.

(27) *Cyclops hyalinus,* Rehberg.

A few specimens found in pools near the Pyramids.

(28) *Cyclops emini,* Mrazek.

This Central-African species was found in collections from the Blue Nile, but a few specimens were also taken near the Pyramids of Gizeh.

(29) *Cyclops dybowskii,* Lande.

Pools by the Pyramids and at Dahchour.

(30) *Cyclops planus,* Gurney.

This species, which is common in Algeria and Tunisia, occurred in collections made near the Pyramids of Gizeh and at Kostamneh in Nubia.

(31) *Cyclops varicans,* Sars.

Zoological Gardens at Cairo.

(32) *Cyclops bicolor,* Sars.

Zoological Gardens and near the Pyramids.

(33) *Cyclops serrulatus,* Fischer.

Specimens of the typical form occurred in the Zoological Gardens, at Lecht, and near the Pyramids, but the form *varius,* Lillj., was also found in a pool in the Gardens.

The distinction between the various forms of *Cyclops serrulatus* seems to me of doubtful value. The presence or absence of hairs in the hyaline membrane of the first antennæ is often exceedingly difficult to ascertain with certainty, and the remaining characters are variable and difficult to estimate. The so-called hairs in the membrane are, I believe, not hairs, but a striation due to a wrinkling of the membrane.

(34) *Cyclops prasinus,* Fischer.

Zoological Gardens at Cairo.

(35) *Cyclops phaleratus,* Koch.

One specimen only was found in the Zoological Gardens.

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EXPLANATION OF PLATE II.

Fig. 1. *Moina dubia*, Richard. Female from the Blue Nile, × 100.
Fig. 2. Ditto. First antenna of male, × 260.
Fig. 3. *Moina salinarum*, Gurney. Postabdomen of female, × 190.
Fig. 4. Ditto. Head of male from below, × 150.
Fig. 5. *Alona rectangula*. Part of postabdomen of female, × 1050.
Fig. 6. *Chydorus* sp.? Postabdomen, × 260.

V.—*New Species of Heterocera from Costa Rica.*—IV.

By W. Schaus, F.Z.S.

Eriopyga durascula, sp. n.

♂. Head, collar, thorax, and fore wings light brown tinged with lilacine. Abdomen fuscous, the last segment and subdorsal tufts brown; anal hairs yellowish. Fore wings thinly irrorated with black; a fine black antemedial shade, incurved in cell, outcurved below cell; orbicular and reniform very large, outlined in buff; the postmedial fine, black, indistinct, slightly incurved below reniform, followed on veins by black and greyish irrorations; a subterminal straight buff line; the veins terminally irrorated with black and greyish; base of fringe finely buff. Hind wings thinly scaled, fuscous grey; the fringe luteous.

Expanse 31 mm.

Hab. Volcano Poas.

Belongs to the group of *E. purpurigera*, Gn.

Eriopyga rubicundula, sp. n.

Basal half of antennæ white. Head, collar, and thorax olive-brown. Abdomen above grey, tinged with roseate posteriorly; anal hairs ochreous brown; underneath tinged with roseate. Fore wings olive-brown tinged with red; the costa and inner margin finely roseate; a small red spot at base of cell; an antemedial red spot below cell, with faint traces of a line to inner margin; a medial red line across cell obliquely to vein 3, angled and inwardly oblique to inner margin; reniform large, outlined by a fine red line, and with a small fuscous spot posteriorly; a geminate fine red outer line, angled at vein 7, then nearly straight to inner margin, filled in with a pale shade; subterminal reddish scales on veins; marginal red scaling, interrupted by black and white irrorations on veins; fringe tipped with roseate. Hind wings fuscous grey tinged with brown; the fringe roseate. Wings below roseate; the disk of fore wings fuscous; a few long hairs in cell.

Expanse 29 mm.

Hab. Juan Vinas.

Eriopyga evanida, sp. n.

♀. Palpi laterally brown, tipped with whitish; third segment light brown. Head and front of collar whitish buff; collar behind and thorax brownish buff. Abdomen grey, with fuscous hairs and irrorations. Fore wings light brownish buff; a basal and an antemedial fine black line; the orbicular and reniform creamy buff, the latter crossed by a faint brown shade; the postmedial fine, black, deeply lunular between veins, punctiform on veins; a very faint paler subterminal shade; a terminal dark line at tornus. Hind wings fuscous grey.

Expanse 29 mm.

Hab. Volcano Poas.

Eriopyga volcania, sp. n.

♀. Head, collar, and thorax dark brown. Abdomen fuscous brown; sublateral whitish tufts at base. Fore wings dark silky brown tinged with steel-grey, the outer margin with bronze; some duller dark brown shadings on base of costa; the lines fine, very dark brown, the antemedial projecting outwardly on submedian fold, the postmedial lunular; orbicular and reniform outlined in very dark brown, the latter shaded with bronze within; a fine, dark, subterminal wavy

line; fringe bronze. Hind wings silky brownish grey; a dark shade on discocellular; fringe outwardly white.

Expanse 36 mm.

Hab. Volcano Turrialba.

Eriopyga turrialba, sp. n.

♂. Head, collar, and thorax lilacine brown. Abdomen fuscous above, roseate brown underneath. Fore wings lilacine brown, darkest in cell; median vein from basal line buff; a deeply dentate buff basal line, partly edged with black; antemedial outwardly oblique on costa, buff, edged with black, fine, black, single in cell, below cell fine, black, interwoven with a light brown line; orbicular large, irregularly triangulate, a linear buff line finely edged with black; reniform large, whitish, somewhat lunular, finely edged with black, inwardly crossed by a fine dark line, and with a dark spot posteriorly; above reniform on costa an inwardly oblique buff line edged with black; postmedial fine, black, indistinct, followed by geminate dark spots on veins separated by whitish spots; veins terminally irrorated with fuscous and grey; a terminal black line, interrupted by whitish points at tips of veins. Hind wings fuscous brown; the fringe roseate brown. Fore wings below with long downturned roseate brown hairs; a curved postmedial space with similar fuscous hairs; buff upturned hairs along submedian. Hind wings: the costal half to short postmedial dark line with downturned roseate brown hairs; a dark spot on discocellular; inner half of wing fuscous grey, apical area roseate brown with dark irrorations.

Expanse 30 mm.

Hab. Volcano Turrialba, 5800 feet.

This species belongs to the group of *E. lodebar*, Druce.

Eriopyga renalba, sp. n.

Palpi brown, fringed with white in front. Head, collar, and thorax brown, the latter faintly tinged with violaceous. Abdomen above black; anal hairs light brown. Fore wings silky brown, the veins tinged with fuscous grey; buff mottlings at base; the antemedial hardly perceptible, darker, geminate on costa and inner margin, separated on costa by a buff shade; a white point edged with black as orbicular; reniform large, white, outwardly oblique from subcostal, containing some brownish scales; a medial broad darker shade; a buff streak on costa above reniform; postmedial very indistinct, lunular, with dark points on veins; subterminal dark

velvety spots, outwardly shaded with a few whitish scales; terminal whitish points at ends of veins. Hind wings silky brown, tinged with fuscous on inner margin; fringe whitish, tinged with roseate brown. The hind wings below are covered with downturned hairs, the costal half roseate brown; a black spot on discocellular; a faint subterminal line below costa.

Expanse 33 mm.

Hab. Poas, Juan Vinas.

Near *E. flammans*, Dogn.

Eriopyga cachia, sp. n.

♂. Head, collar, and thorax light brown; a brown-black spot on middle of collar. Abdomen light greyish fuscous above. Fore wings light brown, shaded with grey beyond postmedial; lines fine, black, geminate, filled in with faintly lighter brown, the basal line wavy; the antemedial slightly outcurved, preceded by a small black spot on submedian; a medial wavy black shade; the postmedial oblique from costa to vein 6, then nearly straight, followed by geminate black spots on veins from 6 to submedian, and with some white scales; subterminal also geminate, incurved on costal margin and parallel with postmedial; a terminal lighter brown lunular line, enclosing small black spots between the veins. Hind wings greyish fuscous; a darker terminal line; fringe light brown. Wings below whitish buff; a dark postmedial line; the costal margins roseate brown, with darker irrorations; the discal area of fore wings shaded with fuscous, and with long downturned hairs in cell; a dark discal point on hind wings.

Expanse 32 mm.

Hab. Cachi.

Near *E. infirma*, Gn.

Eriopyga poasina, sp. n.

Palpi brown, outwardly fuscous. Head light brown, collar and thorax slightly darker brown. Abdomen fuscous brown; anal hairs light reddish brown. Fore wings glossy fuscous brown, the lines broad, buff-brown; the antemedial nearly straight; the postmedial faintly oblique from costa to vein 6, straight to vein 3, slightly incurved to submedian, and inbent below it; the orbicular a small black spot; reniform nearly quadrate, buff-brown, edged with black and containing some black scales; the subterminal line, wavy,

paler, barely perceptible on costa only. Hind wings fuscous, tinged with brown; the fringe slightly roseate. Fore wings below with long hairs in cell and postmedially. Hind wings roseate brown; a black spot on discocellular; a postmedial fuscous line; outer margin shaded with fuscous.

Expanse 33 millim.

Hab. Volcano Poas.

Near *E. pyropis*, H.

Eriopyga cartagensis, sp. n.

Palpi black, buff-brown above. Head and collar buff mottled with brown. Thorax brown. Abdomen greyish, irrorated with black and with transverse dark lines; anal hairs reddish buff. Fore wings brown; a brown-black velvety basal line, thicker and geminate on costa, and followed by a large spot below cell, with a line projecting anteriorly towards antemedial; the antemedial similar, almost obsolescent in cell, geminate on costa and below cell, outset below submedian; the orbicular and reniform equally large, dark brown, laterally edged with velvety-black lines, both oblique towards middle of wing and connected posteriorly by a broad velvety-black band; outer half of costa spotted with dark brown and roseate buff; postmedial fine, geminate, darker brown but indistinct, followed on vein 6 to submedian by geminate velvety spots; the subterminal similar, the outer line thicker between 5 and 6 and 6 and 7; terminal dark spots between the veins. Hind wings whitish, the veins and outer margin shaded with fuscous; a dark streak on discocellular; fringe roseate, crossed by a greyish line. Fore wings below with downturned hairs in and below cell, which are yellowish white below cell. Hind wings whitish irrorated with brown, the costal margin broadly tinged with roseate brown; a black spot on discocellular; a postmedial dark line, obsolescent on inner margin.

Expanse 30 mm.

Hab. Cartago, Sixola.

Near *E. goniostigma*, Schs.

Eriopyga limonis, sp. n.

♀. Head and thorax brown. Abdomen fuscous brown, the anal hairs slightly reddish brown. Fore wings brown; a faint basal line buff, edged with black across costa and cell, followed by a whitish point on subcostal; a fine black antemedial line at a third from base, geminate on costa, followed by two whitish points below subcostal; a medial fuscous

shade, outwardly angled below reniform, which is large, constricted, finely outlined with white, and contains a whitish line; the postmedial line finely lunular, black, followed by geminate dark points on veins; an irregular series of subterminal small whitish spots inwardly shaded with black, terminating in a larger spot at tornus; a terminal pale line inwardly edged with black and thickened at end of veins. Hind wings fuscous brown, palest at base; a terminal dark line.

Expanse 44 mm.

Hab. Juan Vinas.

Allied to *E. monilis*, Gn., but easily distinguished by the darker hind wings and the reniform.

Callierges tropicalis, sp. n.

Head brown, crossed by dark brown lines; collar grey, bordered with light brown in front, with dark brown behind, and crossed by three fine brown shades. Thorax brown; a broad whitish streak on patagia. Abdomen pale reddish brown; black and grey subdorsal tufts on first four segments. Fore wings: the costal margin grey, crossed by dark lines; base of cell, median vein between cell and fold to vein 2, below fold, and on inner margin antemedially buff, shaded with light brown; base of submedial fold whitish buff, and a similar streak near base of inner margin, followed by a black streak beneath it; pale streaks in and below cell from vein 2 to reniform; the cell anteriorly and reniform space shaded with greyish buff; a reddish-brown line on discocellular; a brown streak below fold from base to a dark brown shade, which follows the buff area; the postmedial area light grey, incurved to inner margin, and crossed by a row of dark points on veins; some whitish subterminal streaks between the veins, followed by dark brown streaks on margin; between veins 4 and 5 the brown streak extends from reniform; the shortest streak terminal, between 3 and 4; a brown area at tornus, streaked with dark brown and white; fringe crenulate brown, with white spots at ends of veins. Hind wings white on basal half, the outer half fuscous; veins 2, 3, 4, and 6 with blackish streaks; fringe brown, tipped with white.

Expanse 35 mm.

Hab. Juan Vinas.

Speocropia grandimacula, sp. n.

♀. Head, collar, and thorax brown irrorated with black.

Abdomen above fuscous; subdorsal brown tufts on segments 2–4. Fore wings brown irrorated with black, the veins dark greyish; a fine antemedial velvety-black line; the medial area below submedian fold velvety black-brown, surmounted by a small dark spot near antemedial line; the postmedial fine, black, outcurved around cell, outwardly finely edged with light brown, and at submedian with white; a subterminal dark velvety spot between veins 4 and 5, and a much smaller spot above 5; submarginal white scales on veins; terminal white points on veins; fringe fuscous and brown, cut by light brown shades at veins. Hind wings brown; a dark postmedial line, followed above anal angle by buff and dark lines; a terminal lunular dark line inwardly edged with buff.

Expanse 46 mm.

Hab. Juan Vinas.

Allied to *S. œnyra*, Druce.

Cropia philosopha, sp. n.

♂. Head, collar, and thorax dark purplish brown. Abdomen brown, with reddish-brown dorsal tufts on four basal segments, and a dark round patch on last segment, not always present. Fore wings dark brown; a geminate antemedial lilacine white line, curved from costa to submedian, and again below it, closely followed by a third similar line from subcostal, and a darker brown space between cell and submedian; orbicular large, faintly edged on either side with lilacine and containing a similar streak; reniform large, light brown, inwardly edged with lilacine white, outwardly by the blackish-brown postmedial shade, which is wavy to inner margin; a geminate, subterminal, lilacine white, wavy line, followed by an irregular lilacine marginal shade; the veins partly streaked with whitish; terminal white points on veins. Hind wings brown; a fine darker postmedial line and vague subterminal shade; a dark grey spot at anal angle between two white lines. Underneath the fore wings are brown, the inner margin and hind wings whitish buff; broken antemedial and postmedial lines and an indistinct subterminal shade; a brown spot on discocellular of hind wings; a patch of light brown rough scales on fore wings before discocellular.

Expanse 55 mm.

Hab. Tuis.

Allied to *C. phila*, Druce, but much larger and with entirely brown hind wings.

Cropia submarginalis, sp. n.

♂. Head, collar, thorax, and fore wings grey-black, the veins velvety black. Abdomen fuscous; subdorsal dark brown tufts. Fore wings: a basal curved line, geminate, followed by another dull black, fine, and indistinct shade; the antemedial slightly outcurved between the veins, connected with postmedial by a line curved upwards towards cell, then down to postmedial; orbicular space large, containing some white scales, and limited except along subcostal by a finer velvety line, partly edged with white scales; the medial line outcurved, touching reniform, and crossed in cell by an inwardly oblique line surmounted by a heavier streak on costa, outbent below submedian fold; the reniform dull grey irrorated with white; the postmedial obliquely wavy to vein 4, then incurved wavy to inner margin, followed by a whitish shade; subterminal ochreous-brown shadings, crossing a dark streak between 4 and 5 and one on submedian fold; a terminal dark line and white points at tips of veins; fringe brown-black. Hind wings dark brown; a postmedial black line, followed by white scales; a dark spot and submarginal white scales at anal angle; a terminal whitish line below apex. Fore wings below silky brown, the inner margin white; a dark medial spot on costa and line across cell; a postmedial line, heaviest on costa and below submedian fold. Hind wings below white tinged with brown; an antemedial line, heaviest on costa, a spot on discocellular; a dentate postmedial line, heaviest on inner margin; faint subterminal spots.

Expanse 43 mm.

Hab. Juan Vinas, Tuis.

Heterochroma viridipicta, sp. n.

Palpi pale reddish brown, dark brown laterally. Head lilacine brown; dark brown spots on vertex. Collar dark lilacine grey and light reddish brown. Thorax dark violaceous brown, streaked with green. Abdomen lilacine brown and grey, reddish brown subdorsally. Fore wings black-brown; the costa and inner margin finely reddish; a dentate basal green line; the antemedial black, irregularly outcurved and inbent on inner margin, broadly shaded with green, followed on submedian fold by a white spot and in cell by a reddish-brown shade extending along median towards reniform, and followed by a dark spot edged on either side by a fine green line; the reniform irregular, reddish brown,

inwardly edged by a dark line, and outwardly crossed by a similar line and some green scales; the postmedial blackish, lunular, dentate, only slightly outcurved, and outwardly shaded with green; veins 2, 3, and 5 on postmedial space edged with roseate brown to subterminal line, which is white, indentate just above submedian, spotted with roseate brown on veins; outer margin with a broad green shade, interrupted by the veins, which are brown irrorated with lilacine, and incurved between the veins, leaving terminal brown spots; fringe roseate brown at base, tipped with dark brown. Hind wings fuscous brown, tinged with roseate; the fringe roseate.

Expanse 53 mm.

Hab. Tuis, Juan Vinas.

Heterochroma exundata, sp. n.

♂. Head and collar mottled buff-grey and dark brown, the collar shaded posteriorly with green. Thorax mottled brown and green. Abdomen grey-brown, with pale subdorsal tufts. Fore wings brown; patches at base below cell to antemedial, the orbicular and a spot below it, also large subterminal patches, obsolescent between veins 3 and 4, very dark brown, partly edged with black; the antemedial and postmedial line fine, wavy, black, broadly shaded with green; a green basal line and green mottlings along costa; the orbicular, reniform, and spot below orbicular partly edged with white; the subterminal patches outwardly edged by a wavy white line, lunular on costa, which immediately distinguishes this species from *H. beryllus*, Gn.; the subterminal space between 3 and 4 light brown; the outer margin pale olivaceous brown, with irregular dark terminal spots between the veins inwardly shaded with buff, which extends on to fringe at veins; the veins outwardly speckled black and white. Hind wings fuscous brown, palest at base, but not white as in *H. beryllus*; a darker postmedial and terminal line.

Expanse, ♂ 39, ♀ 42 mm.

Hab. Juan Vinas.

Heterochroma ligata, sp. n.

Head, collar, and thorax brown, mottled with buff. Abdomen buff, shaded with light brown. Fore wings brown, mottled with lighter brown and buff, darker brown before and beyond reniform; antemedial, medial, and postmedial light brown lines on costa, edged with dark brown; veins irrorated with grey and light brown; some black-brown at

base below cell; the medial oblique towards reniform, inset in cell, suffusing with vague orbicular shade, and lunular to inner margin, light brown, edged with dark brown; reniform large, somewhat lunular, edged with light brown anteriorly, with white posteriorly; the postmedial on costa only; an outer line at three-fourths from base, inwardly oblique from costa to submedian fold, then outbent, light brown, edged with darker brown, and intercepted by the veins; a subterminal white shade outcurved from 6 to 3, again between 3 and 2, and then wavy to tornus; an interrupted marginal white line, edged on either side with dark brown, more broadly on inner side between veins 5 and 8; the inner dark shadings are also inwardly edged by buff-brown; fringe dark brown, tipped with light brown and intercepted by buff-brown at veins. Hind wings brown, shaded with buff at base and terminally; dark, fine, terminal lines at ends of veins; fringe pale buff.

Expanse 53 mm.

Hab. Juan Vinas.

Phuphena multilinea, sp. n.

Palpi, head, collar, and thorax light brown. Abdomen dorsally light brown on two basal segments, otherwise fuscous; underneath whitish grey. Fore wings light brown, the outer margin broadly whitish, crossed by nearly straight darker brown lines from subcostal to inner margin; two basal, three antemedial, and three postmedial lines, the latter followed by a less distinct and somewhat broken subterminal shade; a broad darker brown medial shade from below cell, above it a short streak and the reniform, which is large, dark, and contains a light brown streak; a submarginal grey shade, outwardly edged by a white line, slightly incurved from apex to vein 4, and followed by dark brown; fringe light brown, divided by a dark line. Hind wings fuscous brown; the fringe white, with a few dark scales. Underneath the fore wings are dark brown, the outer and inner margins white, the costal margin buff; the hind wings white, thinly irrorated with brown, and traces of a postmedial line.

Expanse 30 mm.

Hab. Sixola.

Phuphena zelotypa, sp. n.

Body brown above, underneath reddish brown. Fore wings brown, tinged with lilacine; a light brown basal line, somewhat oblique inwardly from costa; the antemedial line

light brown, outwardly edged with reddish brown, inwardly oblique on costa, then nearly straight to inner margin; spots indistinct, indicated by pale lines; the postmedial slightly outcurved around cell, preceded by a vague fuscous shade, light brown, inwardly edged with reddish brown; a subterminal straight pale line from costa near apex to tornus, outwardly shaded with dark brown; a geminate pale marginal line from apex, angled between veins 5 and 6, leaving a dark brown terminal spot between vein 5 and apex, and small spots below vein 5. Hind wings dark brown, the fringe paler.

Expanse 23 mm.

Hab. Juan Vinas, Guapiles.

Chytonix elegans, sp. n.

Head, collar, and thorax light green, the patagia mottled with white. Abdomen whitish, irrorated posteriorly with black. Fore wings pale green; lines broad, white; a curved basal line, inwardly shaded with black scales below cell; the antemedial outcurved; the postmedial twice slightly curved, inwardly shaded with black scales, forming a spot on costa; a black medial shade across costal margin; a black oblique shade below cell connecting the antemedial and postmedial lines; orbicular round, black, edged with buff; reniform space white, crossed by a black spot; a white shade on costa at apex; a fine, lunular, subterminal buff line, preceded by reddish-brown shading and followed by fuscous-grey shades; large terminal black spots between the veins; fringe olivaceous, with paler streaks at veins. Hind wings whitish at base, otherwise fuscous; a dark spot on discocellular; fringe olivaceous, with darker shadings.

Expanse 19 mm.

Hab. Juan Vinas.

Monodes medioclara, sp. n.

Palpi outwardly brown, inwardly grey. Head grey irrorated with brown. Collar dark brown on anterior half, whitish grey behind. Thorax whitish grey, the patagia dorsally fringed with black. Abdomen pale greyish brown. Fore wings: the basal third obliquely to middle of inner margin and the postmedial space broadly greyish brown; the medial space whitish grey; a geminate curved brown basal line, indistinct; the antemedial wavily oblique, geminate, partly filled in with white; orbicular round, grey, broadly edged with white and beyond by a fine black line; reniform

similar, large, oval, slightly oblique, crossed by a grey-brown shade ; a blackish streak at base of inner margin, surmounted by an outwardly oblique dark shade ; a dark brown spot medially on costa ; a geminate dark line from reniform to inner margin, filled in with white ; a fine postmedial brown line oblique from costa, angled at vein 6, then nearly straight to inner margin ; above angle of postmedial a black-brown shade to costa, and beyond it from 3 to 6 some velvety spots, the longest between 4 and 5 ; a subterminal whitish shade ; the outer margin darker grey ; a terminal brown line ; fringe grey, spotted with fuscous at veins. Hind wings white ; the costal margin and apex fuscous, narrowing towards anal angle ; a dark spot on discocellular.

Expanse, ♂ 28 mm.

The female has the medial space irrorated with dark grey ; the postmedial line of hind wings below showing above, and the wings more broadly shaded with fuscous.

Expanse 33 mm.

Hab. Cachi, Juan Vinas.

Allied to *M. niveiplaga*, Schs.

Ogdoconta pulverulenta, sp. n.

Head, collar, thorax, and fore wings lilacine brown, thickly irrorated with lilacine. Abdomen and hind wings fuscous brown. Fore wings : the lines dark brown, only faintly indicated on costal margin ; the veins dark brown from antemedial to subterminal line ; the antemedial nearly straight ; the orbicular round, linear ; an oval linear spot below orbicular ; the reniform space large, inwardly limited by a brown line, outwardly by the postmedial ; the veins on reniform space not dark ; the subterminal heavily marked, curved below costa and parallel to postmedial, followed by a brown shade outwardly dentate on veins, with clusters of lilacine scales between them ; a terminal dark line, inwardly shaded with lilacine.

Expanse 30 mm.

Hab. Juan Vinas.

Allied to *O. cymographa*, Hmpsn.

Ogdoconta pulvilinea, sp. n.

Head, collar, and thorax brown, irrorated with lilacine. Abdomen greyish. Fore wings silky grey-brown, irrorated with lilacine on costa and near the lines, which consist of lilacine scales and are very fine ; the basal line outwardly oblique from costa ; the antemedial lunular, straight ; the

orbicular linear; the reniform consisting of two wavy lines, the outer one following the postmedial closely to inner margin; the postmedial straight from subcostal to vein 3, then incurved; the lilacine scales beyond postmedial almost forming another line; a subterminal wavy line; a marginal white line; lilacine streaks on fringe at ends of veins. Hind wings silky grey, shaded with fuscous; the fringe white.

Expanse 22 mm.

Hab. Avangarez.

Emarginea anna, sp. n.

Head white. Antennæ black, the basal joint white. Collar and thorax black, slightly irrorated with pale reddish brown; metathorax pale reddish brown. Abdomen above fuscous black, laterally, underneath, and anal hairs creamy buff. Fore wings: the base pale reddish brown, broadest on inner margin, with outwardly a few black scales on costa, inner margin, and at fold; some black scales at base chiefly near median and a black line on costa; medial space white, with a triangular patch of black scales on costa; a broad blackish postmedial shade curved over end of cell and continuing straight to inner margin as a finer line; the outer margin pale reddish brown; fringe black at apex, middle, and at tornus; a small white spot on costa beyond postmedial. Hind wings white.

Expanse 19 mm.

Hab. Sixola.

Allied to *E. combusta*, Wlk., but quite distinct.

Bryolymnia poasia, sp. n.

♀. Palpi, head, and thorax black, irrorated with white; a white line on frons and vertex. Abdomen whitish, irrorated with black. Fore wings white; the base above submedian broadly blackish, especially anteriorly; the orbicular consisting of a black point within a black annular line and some black scales below it; a few black scales on inner margin antemedially; the reniform large, outlined in black scales and crossed by a blackish shade from costa to inner margin, rather broader and outcurved below cell; the postmedial fine, black, oblique from costa to vein 6, then straight and indentate on submedian fold, preceded by a large blackish spot above vein 4 and followed by black above vein 6 to costa; the outer margin dirty white, shaded with grey except at apex and crossed by a whitish subterminal shade. Fringe mottled white and black. Hind wings white, the outer

margin suffused with fuscous; a fuscous spot on discocellular; a faint postmedial line.

Expanse 31 mm.

Hab. Volcano Poas.

Allied to *B. atriceps*, H.

Bryolymnia marginata, sp. n.

Palpi black-brown, the last joint white, with a dark spot in front. Head white. Collar white, shaded anteriorly with brown. Thorax brown; metathorax silvery white. Abdomen dark brown. Fore wings: the base black, indentate on subcostal and dentate below cell; the medial space silvery white, with a small black spot on costa; the outer portion of wing dark silky brown, shaded with black towards apex and inwardly obliquely curved from costa to vein 2, then outwardly oblique and sinuous to inner margin; four costal white points near apex; fringe white except at tornus and vein 4. Hind wings fuscous brown.

Expanse 22 mm.

Hab. Tuis.

Calymniodes confisa, sp. n.

Palpi and head brown; collar brown, shaded with dark grey; some metallic steel-grey scales posteriorly. Thorax blackish, metathoracic tuft reddish brown. Abdomen greyish brown. Fore wings light brown, shaded with darker brown and grey, and with buff medially on costa; the base broadly suffused with black except below submedian, limited by the antemedial line, which is velvety brown-black, straight from costa, forming a lunule below cell and below submedian; the orbicular large, round, mottled with buff, circled by a fine brownish line, and containing a faint dark point; a medial dark shade, oblique to reniform, then straight to inner margin; the reniform large, indistinct, partly edged with white, followed by a velvety brown-black spot which fills in the angle produced by the dark velvety postmedial, which is wavily oblique from a dark costal spot, curved between 6 and 5, and is then nearly straight to inner margin, but interrupted by the veins; the postmedial is followed by a greyish shade, mottled with white below vein 3, and outwardly limited on costa by a short, curved, black subterminal line; a brown terminal line interrupted by whitish points at tips of veins. Hind wings fuscous, palest at base, showing the dark discal spot of underside. Underneath white; fore wings with a fuscous shade from middle of cell to outer margin; a medial

dark spot on costa and a faint postmedial and subterminal line; hind wings with the postmedial heavily marked, lunular, and interrupted by the veins, also a large dark spot on discocellular; the outer margin shaded with fuscous, on which there is a straight subterminal line.

Expanse 31 mm.

Hab. Juan Vinas, Carillo.

Basilodes aurata, sp. n.

♀. Head and thorax light brown; the basal joint of antennæ white. Abdomen light silky brown; some whitish hairs on basal segment. Fore wings golden, thickly irrorated with brown, the two lines very fine, darker brown; the antemedial oblique from costa to below orbicular, angled and inwardly oblique to submedian, where it is faintly angled again; the spots somewhat greyish, finely circled with brown, the orbicular and reniform the same size, but the latter surmounted by another slightly smaller spot; the postmedial oblique from costa, angled between 7 and 6, inwardly oblique and slightly sinuous; the veins finely streaked with brown. Hind wings golden fuscous; the cilia tipped with white.

Expanse 35 mm.

Hab. San José.

Chalcoesia gloria, sp. n.

♀. Head, collar, and thorax light brown, faintly suffused with purplish; metathoracic tuft reddish brown. Abdomen light brown. Fore wings: the basal third purple-grey, overlaid basally on costa, in and below cell with buff scales streaked with brown, and limited by a dark brown line, inwardly shaded with reddish brown, very slightly curved from costa to inner margin; the dark outer line inwardly oblique from costa to near vein 5, then outwardly oblique and curved between vein 3 and fold; the medial space dark greyish near antemedial line, tinged with olive-green on costa, fading to whitish before postmedial, the inner margin lighter grey, and a large bright roseate patch in curve of postmedial; the outer margin olive-green, becoming paler terminally. Hind wings fuscous brown; the fringe luteous.

Expanse 33 mm.

Hab. Sixola.

Chalcoesia patricia, sp. n.

♂. Head, collar, and thorax brown; the metathoracic tuft

reddish brown. Abdomen above fuscous grey, tinged with brown subdorsally. Fore wings: the basal third dark purplish grey, limited by a curved dark brown line, and overlaid with buff and light brown scales on base of costa, cell, and just below cell; medially the costal and inner margin olive-grey, otherwise olive-yellow; a faint outer line, oblique from costa to vein 6, then rounded and incurved to inner margin; the outer margin pale roseate brown, irrorated with white; the costa apically olive-brown. Hind wings fuscous brown, the veins darker; cilia yellowish buff.

Expanse 29 mm.

Hab. Sixola.

Bagisara pacifica, sp. n.

♂. Body and fore wings greyish buff, faintly tinged with brown. Fore wings somewhat glossy, the lines paler; a medial line slightly outcurved on subcostal, incurved below it to inner margin close to postmedial, which is outcurved beyond cell, then inwardly oblique, but very slightly so, to inner margin; the subterminal outcurved on costa, then straight to tornus; terminal black points on either side of vein 3; a faint darker shade on discocellular. Hind wings yellowish buff.

Expanse 31 mm.

Hab. Avangarez Mines.

Bagisara avangareza, sp. n.

♀. Palpi dark buff. Head and collar creamy white. Thorax and abdomen buff. Fore wings yellowish buff, tinged with lilacine brown on inner margin and outer margin from vein 6 to tornus; the lines fine, slightly wavy, brown; the antemedial barely curved on costa, preceded by a vague fine brownish shade below cell; the postmedial slightly outcurved beyond cell and closely followed by a fine dark shade and a few dark irrorations; the subterminal fine, slightly outcurved; the outer margin terminally darker brown; fringe dark violaceous. Hind wings whitish at base, shading to ochreous on outer margin.

Expanse 29 mm.

Hab. Avangarez Mines.

Bagisara albicosta, sp. n.

♂. Palpi buff, with dark irrorations. Head and thorax brownish buff. Collar whitish. Abdomen brownish buff

above, luteous underneath. Fore wings pale cupreous brown, the costa and lines white; the inner margin shaded with buff, broadly before subterminal line; a faint oblique basal line; the antemedial oblique from costa to submedian beyond middle; a white streak on discocellular; the postmedial slightly incurved, not reaching inner margin; the subterminal slightly oblique inwardly from costa to vein 5, then outbent to tornus; the outer margin rich cupreous brown; a terminal row of black points. Hind wings yellowish buff, with long wedge-shaped iridescent marks at ends of veins.

Expanse 39 mm.

Hab. Avangarez Mines.

Pœctes curvilinea, sp. n.

♂. Palpi brown laterally, white in front. Head olive-brown, spotted with black. Collar buff, shaded in front with olive, posteriorly tipped with white. Thorax and base of abdomen black and brown; abdomen otherwise grey above, the last two segments and underneath light reddish brown. Fore wings: the costal margin light brown at base, tinged with olive outwardly; a white spot at apex; a broad buff patch at base below cell; a black streak on base of submedian, outwardly bifurcating; the lower streak curving to inner margin, the upper streak ascending on antemedial, which is light brown, geminate, curved from submedian to subcostal; a steel-grey spot at base of inner margin; medial space grey, shaded with brown and olive on inner margin, extending beyond cell towards apex; a fine medial and postmedial line crossing this grey portion; orbicular small, light brown edged with grey; the reniform large, diffuse, light brown; from outer margin below white apical spot a velvety black-brown line, incurved to inner margin at three-fourths from base, preceded in part by a finer dark line, and followed by a broad dark grey shade on which are some darker lines, and a light brown subterminal shade above tornus; an interrupted dark brown marginal line; fringe brown and fuscous. Hind wings fuscous brown, whitish hyaline at base, below cell, and in interspaces close to cell; the inner margin grey, crossed by three black lines; fringe grey and fuscous.

Expanse 25 mm.

Hab. Juan Vinas.

Charadra nitens, sp. n.

♂. Palpi dark brown laterally, whitish in front, the third

segment buff. Head mottled grey and brown. Collar light brown in front, then a black-brown transverse line, and whitish behind. Thorax whitish grey; some fine transverse black lines posteriorly. Abdomen brown-grey; the subdorsal tufts mottled grey and whitish. Fore wings silky grey, shaded with light brown, especially on outer margin; a black basal line; an antemedial and a medial black line, connected by a dark streak on fold below cell; a darker grey shade in cell and on costa before antemedial; the medial space shaded with brown; the medial line inwardly geminate on costa and cell, preceded and followed by a duller brown spot; the postmedial space broadly whitish above vein 4, crossed by a fine brown line shaded with white below vein 3 to inner margin; a subterminal dark shade oblique from costa to vein 6, then inset and paler to vein 2, below which it is again darker; dark terminal streaks on veins and a terminal blackish line intercepted by veins; fringe grey-white. Hind wings fuscous grey, the veins darker; a terminal dark line.

Expanse 39 mm.

Hab. Juan Vinas.

The female is more uniformly grey, the orbicular better defined.

Expanse 44 mm.

Plusia limata, sp. n.

Head, collar, and thorax olivaceous brown, the collar and patagia tipped with lilacine. Abdomen buff-grey, darker subdorsal tufts at base. Fore wings lilacine, thinly irrorated with olive-brown, and with similar shadings at base and on costa; the medial space, below cell and silver mark, metallic brown; a lilacine basal line; the antemedial fine, brown, outwardly edged with lilacine, and white below cell; orbicular annular, finely edged with olive-brown and anteriorly irrorated with brown; the reniform consisting of a dark shade, inwardly limited by a lilacine line edged with brown, and outwardly containing an indistinct curved silvery line; below cell and orbicular a silvery line along vein 2, abruptly bent back and curving to median, the sharp point thus produced filled with silver, and leaving a small triangular lilacine space between vein 2 and median; the postmedial fine, dark brown, slightly incurved below vein 5 and outwardly shaded with clear lilacine; a broad subterminal bronze shade outwardly limited from above vein 3 to apex by a straight

brown line; a fine terminal dark line. Hind wings grey-brown, the veins darker; some whitish shades in cell and just beyond.

Expanse 39 mm.

Hab. Juan Vinas.

Very closely allied to *P. feisthameli*, Gn., but the silver mark is quite different.

Plusia meretricia, sp. n.

Head and collar brown shaded with roseate, the collar tipped behind with roseate. Thorax greyish brown, with darker mottlings. Abdomen covered with long ochreous-brown hairs. Fore wings: costal margin olive-brown, shaded and spotted with roseate buff; base olive-brown, limited by a straight whitish basal line, geminate on costa; antemedial space olive-brown above median, roseate below, with two black points; the antemedial line geminate on costa, obsolescent in cell, single below it, white, finely edged with brown; cell on medial space tinged with roseate; the orbicular large, finely outlined in dark brown, and also by a silver line at submedian; the reniform large, consisting of a dark brown shade, crossed by a lilacine shade, and with three curved silvery lines, two posteriorly and one anteriorly and outwardly; medial space below cell metallic bronze; a silvery *v* below orbicular and a round silvery spot more outwardly and well separated from it; postmedial fine, dark bronze, shaded on either side with roseate buff, slightly incurved below vein 4; the outer space metallic bronze, with a darker subterminal shade; a marginal straight roseate buff shade from apex to vein 4, becoming broader below vein 4; a terminal brown line. Hind wings silky fuscous brown.

Expanse 42 mm.

Hab. Sixola, El Sitio.

Campometra leucoplaga, sp. n.

♀. Head and collar light brown, irrorated with dark scales. Thorax with a white transverse line posteriorly. Abdomen fuscous; a light brown transverse shade on second segment. Fore wings greyish brown; a black and white wavy basal line, a small black spot at base of inner margin; a broad white antemedial shade, crossed by an irregular black line, and extending in cell to a large white patch at end of cell, which reaches costa and is crossed by a dentate brown line which joins the postmedial below vein 3; the

postmedial fine, black, starting from a triangular black costal spot, which is followed by a white space, also crossed by a dark line ; a broken fine postmedial black line, slightly thicker in places and forming trigonate velvety spots between veins 3 and 5 ; a fuscous shade between postmedial and subterminal ; small marginal white spots outwardly shaded with black ; a crenulate dark terminal line ; fringe grey, with white patches at veins 2 and 5. Hind wings greyish brown ; a white point at end of cell ; vague antemedial and medial lines ; a velvety black-brown subterminal line from vein 6 to anal angle, slightly incurved and terminating in a white spot ; marginal spots and terminal line as on fore wings. Underneath fuscous brown ; the outer margins broadly darker, medial and postmedial broad dark lines.

Expanse 49 mm.

Hab. Tuis.

Campometra meretricia, sp. n.

♀. Head and collar mottled light and dark brown. Thorax grey-brown, irrorated with lilacine and with dark transverse shades. Abdomen grey ; some dark transverse shades. Fore wings : the base to antemedial dark brown irrorated with buff ; a basal black line shaded with white ; the antemedial wavy, blackish, shaded with green-grey scales, more heavily black on inner margin ; the medial space buff, irrorated with dark scales, with a small whitish space below cell ; the orbicular a white point edged finely with dark brown ; a medial dark line, excurved and indentate on median and submedian, and with geminate dark shades on costa and inner margin ; an irregular white spot on reniform, followed by a whitish space to costa and postmedial which arises from a triangular dark costal spot, is dark brown to vein 5, and is followed by a greenish-grey shade incurved below reniform ; a dentate subterminal line ; outer margin mottled brown and grey, with a terminal whitish spot at vein 5 ; an interrupted dark marginal line, a terminal crenulate line. Hind wings brownish grey, with vague geminate medial line ; a fine postmedial line ; a more distinct subterminal line inwardly shaded with dark grey ; the outer margin suffused with whitish. Underneath buff ; the outer margins broadly fuscous ; fine medial and postmedial lines and linear marks on discocellular. Sometimes the green-grey shadings are absent and the medial and postmedial lines are heavily shaded with dark brown.

Expanse 48 mm.

A male has the space from antemedial to postmedial whitish, with the markings almost obsolete except the dark costal patch.

Easily distinguished from *C. leucoplaga*, Schs., by the straighter postmedial line on hind wings.

Campometra angulata, sp. n.

♂. Palpi, head, and collar light brown, the latter edged with dark brown. Thorax light brown, with dark transverse shades and whitish irrorations on patagia. Fore wings brown, with dark streaks between the veins at base and on postmedial space; the subcostal and median buff from base to antemedial, which is oblique to subcostal, angled and nearly straight to submedian, where it is incurved; the antemedial line is white or buff, edged with black-brown, partly coalescing outwardly with an incurved dark medial line which is geminate; a third medial dark line from cell outwardly oblique to inner margin and outwardly shaded with buff; a white spot on discocellular, bifurcating posteriorly and containing a black streak and some buff shadings; a dentate postmedial geminate dark line from veins 7 to 3, and a buff line from its origin to costa at submarginal, which is broad, buff, edged with black; a marginal black line interrupted by veins and preceded by a whitish or buff shade between veins 2 and 5; fringe with paler shades at veins 5 and above tornus. Hind wings brown; a fine dentate dark postmedial line, followed by a paler shade; the submarginal and marginal lines as on fore wings. Underneath fuscous brown; dark spots at end of cells; a fine medial line and broad postmedial dark line.

Expanse 50 mm.

Hab. Juan Vinas, Tuis.

Closely allied to *C. caminata*, Schs., which has the antemedial line curved.

Campometra rufipicta, sp. n.

Head and thorax reddish brown, irrorated with buff; frons buff; some lilacine scales on patagia. Abdomen fuscous; dorsal brown tufts; a black transverse line at base, followed by a dorsal buff spot. Fore wings: costal margin black, shaded with brown, crossed by light brown lines; a line above reniform and origin of postmedial white; the antemedial also finely white; base fuscous, shaded with dark brown; basal and antemedial lines fine, velvety, the latter shaded with lighter brown; orbicular round, blackish;

a geminate dark shade from below orbicular straight to inner margin, followed by a brown shade from subcostal on a paler ground; reniform mottled brown and buff, with two white points below; postmedial finely dentate, lunular, inbent at vein 3 to reniform, shaded with pale buff below it to inner margin; outer margin light brown, crossed by irregular darker shades; a broad subterminal dark shade from vein 6 to costa and a small spot between 3 and 4; a submarginal interrupted dark line; a terminal wavy brown line; terminal darker streaks on veins 3 and 4. Hind wings: the medial space light reddish brown; a fine dark postmedial line; the subterminal broader, dark reddish brown; the submarginal line inwardly shaded with buff, especially towards apex. Underneath silky slate-grey; a faint darker medial and postmedial line; pale terminal shades at vein 4; buff spots on costa of fore wings.

Expanse 44 mm.

Hab. Juan Vinas, Sixola.

Safia minor, sp. n.

Head and thorax mottled reddish brown and grey; frons buff. Abdomen fuscous brown; a dark transverse band on first segment; some buff subdorsally on second segment. Wings brown, crossed by darker lines. Fore wings: the basal half darker brown; a fine black antemedial line, with some reddish irrorations; indistinct medial lines; reniform large, whitish, irrorated and crossed by brown lines; the postmedial fine, dark, only slightly outcurved, inwardly oblique to vein 2, then dentate, straight to inner margin; a subterminal dentate velvety shade above vein 5, followed and preceded by fuscous shades; subterminal reddish shades from vein 5 to inner margin; submarginal dark streaks between the veins; a wavy terminal line. Hind wings: two medial finely dentate lines; a fine velvety postmedial line, followed by another dark line; the subterminal dark velvety brown, shaded with reddish outwardly, toothed on discocellular fold; some fuscous shades near tornus. Hind wings below whitish, irrorated with brown, three transverse lines, and a subterminal fuscous shade; pale streaks shaded with brown on discocellular of both wings.

Expanse 33 mm.

Hab. Sixola.

Safia abscisa, sp. n.

♂. Head, collar, and thorax dark reddish brown; the

frons pale buff. Abdomen dark fuscous grey, with dark brown subdorsal tufts. Fore wings dark brown, the basal half almost black, crossed by a darker, velvety, wavy antemedial line and limited by a similar shade; dark steel-grey shades at base of inner margin, in cell, and beyond antemedial in and below cell; black spots on costa divided by roseate buff lines, the orbicular small, annular; the reniform outlined in white points and streaks; the postmedial outcurved, surmounted by a dark velvety spot on costa, heavily marked beyond cell, incurved to below cell well before reniform, and very fine to inner margin; a subterminal velvety shade near costa; the outer margin broadly shaded with dark steel-grey, almost black, with a purplish tinge; submarginal dark spots inwardly shaded with light brown; a terminal wavy dark line. Hind wings dark brown, pale at apex; a fine postmedial dentate black line, followed by a broad velvety brown-black shade from below vein 6 to inner margin; a large dark lilacine grey space on outer margin between veins 2 and 4, crossed by a pale shade. Fore wings below dull brown, irrorated with white; geminate medial spots on costa and a single medial line; the postmedial finely dentate; a terminal whitish spot at vein 4. Hind wings below dull brown, heavily irrorated with white to postmedial; a geminate medial line; a dark spot on discocellular; the postmedial finely dentate; some white terminally at vein 5 and apex.

Expanse 36 mm.

Hab. Guapiles, Esperanza.

The female has the wings almost entirely suffused with blue-black, the dark subterminal shade on hind wings narrower.

Expanse 40 mm.

Safia permixta, sp. n.

Body and wings brownish buff, tinged with roseate and irrorated with black and dark brown scales. Head mottled with dark brown and white. Collar with a dark transverse line and white tips behind. Thorax streaked with dark brown. Abdomen with dark subdorsal tufts. Fore wings: the base blackish, limited by a velvety antemedial line inwardly oblique from costa, crossed by a velvety basal line and slightly irrorated with buff; orbicular small, light brown; two fine wavy medial lines, dark brown, with another broken line between them; reniform large, outwardly incurved, marked by roseate buff streaks, preceded by a dark

brown spot; postmedial irregularly outcurved, fine, black, more heavily shaded with dark brown on costa, between 5 and 6, and just below vein 2; a subterminal fine dark shade, inwardly oblique and straight from costa to vein 5, then slightly dentate, preceded on costa by a dark line; the outer margin shaded with grey from apex to vein 5, and from above 4 to 3; an interrupted submarginal black line; a wavy terminal black line. Hind wings: an annular shade on discocellular; an antemedial and two medial wavy shades; a fine black wavy postmedial line, followed by a broad blackish shade, and a subterminal velvety black line, straight from apex, angled below vein 6, and very slightly incurved to anal angle, followed by a black shade between 5 and 7; marginal greyish shades between veins 2 and 4; submarginal and terminal lines as on fore wings. Underneath buff, irrorated with grey-brown; two medial and a deeply lunular postmedial dark line; broad marginal fuscous-brown shades; curved pale lines on discocellular, edged with black, and a black point in cell of fore wings.

Expanse 47 mm.

Hab. Guapiles.

Allied to *S. celia*, Cr., but easily recognized by its darker base and a different subterminal line on hind wings.

Cœnipeta sororia, sp. n.

Head: frons brown; vertex grey. Collar white in front, grey behind, and crossed by a dark brown line. Thorax and abdomen grey, tinged with brown; whitish lines posteriorly on segments. Wings brownish grey, lines fine, black. Fore wings: a basal line on costa; the antemedial finely wavy, outcurved, preceded by a paler shade; a medial line from costa, obliquely downcurved around reniform, and then slightly curved to costa, enclosing two wavy lines on costa; reniform brown, with a darker line on discocellular; a lunular faint dark shade from cell to inner margin; the postmedial outcurved beyond cell, the space between filled in with white irrorated with brown and crossed by two fine brownish shades; a subterminal fine dentate shade, whitish above vein 6, and preceded by whitish irrorations; below vein 6 the subterminal is buff-grey, preceded and followed by faintly dark shades; a wavy terminal dark brown line. Hind wings: a dark spot on discocellular containing a pale line, and followed by three finely dentate shades partly edged with grey; the postmedial heavily marked, finely dentate, black, followed below vein 5 by a grey shade; a fuscous patch at

apex; a pale subterminal shade from this patch to anal angle. Hind wings below pale buff, thinly irrorated with brown; a white streak on discocellular, preceded and followed by a black line; postmedial black, lunular, with projecting lines towards base; a broad subterminal black shade.

Expanse 41 mm.

Hab. Banana River, La Florida.

Closely allied to *C. zenobina*, Mssn.

Cœnipeta parilis, sp. n.

Head lilacine brown, shaded with darker brown. Collar lilacine brown, crossed by a dark brown shade; thorax brown, with darker streaks; abdomen fuscous brown, with transverse buff lines posteriorly. Fore wings brown, lightest on outer margin, and with some red irrorations on basal third; the base dark grey, limited by a black line, geminate on costa; the antemedial shade broad, black-brown, divided above median by an oblique grey line, angled in cell, and by a curved grey line on inner margin, outcurved and outwardly produced between median and submedian; a median lilacine brown wavy and outcurved band; end of cell and space beyond to postmedial dark brown, with a blackish line on discocellular; two fine wavy dark shades from below end of cell to inner margin; the postmedial outcurved, black, broadly shaded with white outwardly above vein 6, narrowly with buff below vein 6; a curved subapical black shade; a fuscous marginal shade from vein 3 to just above vein 4; a fuscous shade at tornus divided by a dentate light brown line. Hind wings dark fuscous brown; a broad ochreous postmedial shade from vein 5 to inner margin, and a similar marginal shade divided by a dentate dark shade.

Expanse 42 mm.

Hab. Juan Vinas.

Closely allied to *C. diffusa*, Walk., which has the antemedial and medial markings straighter and a distinct dentate subterminal line.

Barydia pulverosa, sp. n.

♀. Head mottled brown and white. Collar brown, irrorated with grey. Thorax white. Abdomen fuscous, irrorated with grey and white. Fore wings grey, thickly irrorated with fuscous, especially on median space beyond antemedial line; some black at base of costa; antemedial line black, nearly straight; a black point as orbicular; reniform lunular, its convex side towards base, dark grey, edged with black;

three fine wavy dark lines from reniform to inner margin; a dark angled shade beyond reniform; the postmedial fine, black, outcurved from costa, wavy to vein 3, then inset and slightly incurved; outer margin shaded with brown; a subterminal whitish shade and some white terminally between the veins; a curved black shade from costa before apex to vein 6; a terminal wavy black line; fringe whitish. Hind wings grey-brown; a dark shade on discocellular; an indistinct medial and postmedial dark line, the latter more heavily marked at inner margin; a subterminal whitish shade; terminal line and fringe as on fore wings. Underneath whitish grey: dark medial and postmedial shades; dark spots on discocellular.

Expanse 61 mm.

Hab. Sixola.

Barydia fearni, sp. n.

Head and collar brown. Thorax and abdomen grey. Fore wings: the basal space grey-brown, limited by the black antemedial line, nearly straight from costa to below cell, incurved to submedian and outcurved below it; a basal black line enclosing a whitish spot at base of costa, which is otherwise dark brown to antemedial; medial space whitish, irrorated with grey; a black point as orbicular; reniform slightly lunular, outlined in dark grey and black, interrupting a geminate, wavy, dark grey medial line, thickest on costa; the postmedial black, angled below costa, finely wavy to vein 3, then broader and straight to inner margin; outer space light brown; an irregular, broad, black subterminal shade from costa to near vein 3, and also some faint whitish shades; a wavy terminal black line; fringe white, spotted with light brown. Hind wings whitish; a dark shade on discocellular; a fine lunular dark postmedial line, punctiform on veins; a geminate subterminal grey shade; some grey streaks on inner margin.

Expanse 48 mm.

Hab. Avangarez.

Named after Mr. Fearn, manager of the gold-mines at Avangarez.

Palindia albistriga, sp. n.

Body and wings above brown, the fore wings tinged with violaceous; underneath brown-grey. Fore wings: the lines dark brown; some blue scales at base of inner margin; the basal line short; the antemedial and medial parallel, oblique;

the postmedial straight to below vein 3, incurved to vein 2, then close and parallel to medial, and outwardly edged by a white line; reniform long, narrow, paler, edged by a dark line; subterminal slightly darker than ground-colour, outwardly shaded with light brown, twice angled outwardly; a terminal dark line edged on either side by lighter brown; the fringe fuscous grey tipped with whitish. Hind wings: a dark antemedial line straight from costa towards anal angle; a more distinct straight postmedial line with a curved angle near outer margin, outwardly shaded with ochreous, and followed at angle by a silvery patch crossed by dark lines, and two submarginal black spots separated by an ochreous shade, which intercepts a submarginal pale line. Fore wings below with an oblique medial dark shade and an outcurved postmedial line; on hind wings the medial is faintly curved, the postmedial more heavily marked, finely lunular.

Expanse 37 mm.

Hab. Juan Vinas.

Allied to *P. egista*, Bar., but larger, and differing in several respects.

Palindia delecta, sp. n.

Head and collar light brown, the latter tipped with whitish buff, and some similar mottling on frons. Thorax whitish buff irrorated with light brown. Abdomen above grey; transverse white lines posteriorly on segments; a dark brown dorsal spot at base. Fore wings: the base grey; a broad subbasal oblique white band obsolescent between submedian fold and vein; the antemedial slightly oblique, brown, inwardly separated from the white by a dark blue metallic line, and outwardly broadly edged with black; the medial space to medial line narrow on costa, wider on inner margin, lilacine grey heavily irrorated with blackish scales in and below cell; the medial line broad, brown, edged with black, very oblique and abruptly indentate on submedian, followed by an opalescent shade; reniform white, circled with black, and surmounted by a large white spot on costa; postmedial broad, brown, edged with black, and crossed by a metallic purple line; some black below reniform, and some brown below vein 2 preceding the postmedial; outer margin with broad subterminal black shades at tornus and above vein 4, limited by a submarginal white line; blackish intervenal shadings, and a terminal dark line. Hind wings fuscous brown: a postmedial opalescent spot at vein 2, surmounted by some

dark scales; a subterminal dark line from vein 2–5, followed by opalescent scales and a buff space irrorated with black; a marginal black spot and some silver markings. Wings below yellow: fore wings with broad medial and postmedial dark shades, united between 2 and 5 by a dark brown shade occupying the terminal area beyond postmedial and above submedian; hind wings with medial dark spot on costa and discocellular; postmedial spots on costa and below 6; apical half of outer margin brown.

Expanse 33 mm.

Hab. El Sitio, Sixola, Guapiles.

Palindia affinis, sp. n.

Head white, the frons marked with brown, the vertex with yellow. Collar and thorax pale yellow, the former tipped with light brown. Abdomen pale yellow tinged with ochreous terminally. Wings pale yellow. Fore wings: a subbasal black spot on extreme costa; the antemedial dark lilacine grey edged with black, wide on costa, narrowing in cell and oblique to inner margin beyond middle; the postmedial similar to vein 3, below which it is brown, inwardly edged with black, outwardly with metallic steel-grey, followed by a brown shade, and is less oblique, terminating at tornus; a terminal band consisting of fine black lines; fringe ochreous, tipped with silvery and shaded with fuscous. Hind wings: a large grey space at middle of outer margin, shaded with subterminal opalescent and black scales, with a terminal white streak on vein 4 shaded on either side with darker scales; a terminal dark line, preceded by some white at veins 3 and 5, and also with ochreous brown at vein 5. Underneath luteous; fore wings apically shaded with brown: a postmedial dark shade.

Expanse 28 mm.

Hab. Juan Vinas.

Allied to *P. perduceus*, Wlk., from Jamaica.

Palindia austrina, sp. n.

Body above and wings brown. Fore wings: the medial and postmedial space tinged with lilacine, the costal margin and apex broadly tinged with ochreous; a basal metallic-blue streak on costa; the three transverse bands tinged with ochreous; the antemedial oblique, inwardly edged by a metallic-blue line, outwardly by a finer blackish line; the medial still more oblique, inwardly edged by a black line, outwardly by a metallic-blue line; the postmedial somewhat

curved, edged on either side by a black line and crossed by a metallic-blue line; a submarginal silver line; a dark terminal line punctiform towards apex; fringe fuscous grey. Hind wings: a few postmedial blue scales below vein 2; a subterminal metallic-blue spot from below vein 2 to near 5; some terminal silvery marks. Wings below yellowish; the fore wings brown beyond broad dark postmedial shade, and with a brown medial shade from costa to vein 2; hind wings with a dark medial streak and a broad postmedial shade, both on costa only; the apex brownish.

Expanse 29 mm.

Hab. Sixola, La Florida.

Palindia folium, sp. n.

Body above bright green, the abdomen posteriorly ochreous. Fore wings bright green; three oblique lines from costa, light brown, crossed by darker striæ, and bifurcating on costal margin; the costa finely buff; a dark brown terminal line; fringe brown. Hind wings orange-yellow: the base, a broad streak below cell, widening on outer margin to vein 5, and a streak on inner margin bright green; a fine subterminal streak on green portion ending in a grey spot at vein 2; a dark brown terminal shade from 2–4 and some white spots; fringe dark brown along this space, otherwise brown. Underneath ochreous; the fore wings apically shaded with brown; a medial and a postmedial dark line from costa to vein 2. Hind wings: a medial dark spot on costa; a faint postmedial dark line.

Expanse 34 mm.

Hab. Tuis, Juan Vinas.

Some specimens are smaller than type and paler below.

Allied to *P. chloris* and *P. viridissima*, Bar.

Dyomyx ocala, sp. n.

♂. Palpi, head, collar, and thorax brown. Abdomen fuscous brown. Wings brown shaded with purple; the lines fine, dark brown. Fore wings: an oblique basal line from costa to just below cell; an oblique straight antemedial line; an oblique medial line from costa to ocellus, which is large, black, circled with ochreous and dark brown, and contains some dark blue lines and a white point; the reniform faintly outlined in dark brown; the postmedial slightly oblique to vein 6, then straight to vein 3 and inbent towards ocellus; a fine indistinct subterminal line, outwardly shaded with pale

spots ; a dark marginal line, followed by a pale line, and preceded by a pale interrupted line, forming intervenal spots. Hind wings : a short medial line from below cell ; the postmedial from above vein 5, obtusely angled near margin, followed by a pale shade, and at angle by silvery grey scales and two terminal black spots containing dark blue scales ; the pale line preceding dark terminal line continuous from apex to spots ; the fringe on both wings dark grey.

Expanse 37 mm.

Hab. Sixola.

Dyomyx obliquata, sp. n.

Head, collar, and thorax brown. Abdomen fuscous. Fore wings : the base lilacine brown to antemedial line, crossed by an oblique black basal line from costa to submedian ; the antemedial black-brown, oblique from costa to inner margin ; the medial space crossed by a broad dark brown band from costa to inner margin and containing outwardly on submedian vein a black ocellus with a white point and ochreous border ; this band is outwardly limited by a lilacine oblique line, becoming silvery white from vein 2 to inner margin, and is followed above vein 2 by a lilacine brown space on which the reniform, large and outlined with dark brown, is conspicuous ; the postmedial dark brown, nearly straight from costa to vein 3, then inbent to dark medial shade at vein 2, outwardly shaded with pale lilacine brown ; the outer margin lilacine brown shaded with fuscous except on costa and at apex, crossed by an interrupted light brown subterminal line, and a small black spot between 6 and 7 ; a terminal dark brown line ; fringe dark grey tipped with white. Hind wings fuscous brown : an indistinct dark medial line ; a postmedial dark line outwardly edged with light ochreous brown, straight from above vein 5, and wavily angled at vein 2, where it is followed by some metallic steel-grey scales ; an interrupted pale marginal line with a blue-black spot at vein 2 ; fringe with a white line at base, then a dark grey line, and terminally whitish except from vein 2 to anal angle.

Expanse 47 mm.

Hab. Juan Vinas.

Ophisma nobilis, sp. n.

Head, collar, and thorax dark reddish brown. Abdomen fuscous brown. Fore wings : the base to near middle dark reddish brown, limited by a nearly straight fine white and

lilacine line; a faint pale antemedial streak on costa; the outer portion of wing light brown strongly tinged with lilacine, and thinly irrorated with dark scales; reniform indistinct, still lighter brown with a dark point anteriorly and posteriorly; a dark fine dentate shade from reniform to inner margin, and a more clearly marked similar postmedial line from vein 6; a large dark reddish-brown space at apex, with pale costal points and inwardly edged by a wavy curved white line; terminal lilacine shadings, with small dark marginal spots and a fine dark line beyond them; fringe grey with a darker grey line. Hind wings dark brown; a small pale spot above anal angle; a little lilacine shading terminally from veins 2–4.

Expanse 50 mm.

Hab. Juan Vinas.

Ophisma fulvipuncta, sp. n.

♂. Head and thorax violaceous brown. Collar reddish brown. Fore wings brown strongly tinged with purple, the veins purplish grey; basal and antemedial lines, indistinct, formed by clusters of greenish-grey scales, obsolescent below submedial fold; some medial irrorations on costa; postmedial clusters of scales from costa to vein 3, divided by an interrupted dark line; subterminal clusters of scales above vein 4, chiefly on costa; orbicular oval, darker greenish grey containing a brown streak; a bright small fulvous spot above submedian postmedially; fringe olive and ochreous brown tipped with white. Hind wings dark brown; faint traces of a postmedial pale line, terminating in lilacine scales and some darker brown above anal angle; fringe whitish, becoming ochreous and then brown at anal angle. Underneath brown, heavily irrorated on hind wings and costal margin of fore wings to postmedial with lilacine; the postmedial brown, finely crenulate on hind wings; terminal white points.

Expanse 51 mm.

Hab. Tuis.

Ophisma ? esperanza, sp. n.

Head and thorax olive-brown tinged with lilacine. Abdomen fuscous, with transverse bands of olive-brown hairs. Fore wings: the basal portion olive-brown limited by a fine darker brown line from costa at a third from base to middle of inner margin; the space to outer line brown tinged with lilacine; orbicular as a brown point; reniform consisting of a short dark streak on discocellular; a wavy

shade beyond cell somewhat oblique outwardly; the outer line darker brown, oblique from costa to vein 6, then geminate and straight to inner margin at tornus; outer margin lilacine, irrorated with brown, chiefly near outer line, and extending above vein 6 in a curve to apex; marginal brown intervenal points connected by slightly curved lines. Hind wings fuscous brown; a subterminal whitish line at anal angle; fringe mostly greyish.

Expanse 60 mm.

Hab. Esperanza, Sixola.

Allied to *O. despagnesi*, Gn., which has the two lines parallel.

The above species, with *O. despagnesi*, Gn., and *O. macaria*, Cr., will require a new genus.

Dyops subdifferens, sp. n.

♂. Head and collar fuscous brown. Thorax and abdomen black-brown. Fore wings olivaceous grey; a basal darker line; an antemedial slightly curved darker band followed by a wavy fine dark line; pale transverse lines on either side of discocellulars; a fine black postmedial line, outcurved beyond cell, shaded with whitish from vein 6 to inner margin; outer margin brown with a darker subterminal shade; a submarginal metallic-green dentate line, followed by black ocelli containing paired white points between veins 2 and 3, and 3 and 4. Hind wings dark brown, a darker postmedial line followed from vein 5 to anal angle by a light golden-brown shade; terminal ocelli between veins 2 and 4 edged with silvery green and some metallic terminal shadings. Underneath light brown: fore wings with broad basal, postmedial, and marginal fuscous shades, narrowing on inner margin; a linear spot on discocellular; hind wings with a dark spot on discocellular, a postmedial excurved shade, somewhat incurved before inner margin, and fuscous marginal shades. Sexes similar.

Expanse 36 mm.

Hab. Juan Vinas, Tuis, Cachi.

Allied to *D. ocellata*, Cr., but readily distinguished by the markings underneath, and the double ocelli on margin of fore wings.

Capnodes chiva, sp. n.

♂. Body and wings dark violaceous brown; a postmedial dark line with minute yellowish-buff spots on veins; similar subterminal spots between the veins, and points on a darker

terminal line. Fore wings: an antemedial line with minute whitish spots on median and submedian veins; two large pure white spots on costa at origin of lines. Underneath fuscous grey with dark spots on discollular: fore wings with a postmedial white streak on costa; hind wings with a postmedial and subterminal dark line.

Expanse 25 mm.

Hab. Juan Vinas.

Allied to *C. borrega*, Schs.

Capnodes anguinea, sp. n.

♀. Head, thorax, and wings brown. Abdomen fuscous. Fore wings: an antemedial irregular white line, thickest on costa, shaded with reddish brown in and below cell; a black point as orbicular; reniform kidney-shaped, linear; postmedial dark brown starting from a white spot on costa, below which it is lunular and outwardly edged with reddish brown; subterminal black spots, the largest between submedian and vein 2, and between 5 and 6; marginal black points. Hind wings: a dark shade on discocellular; a medial line similar to postmedial on fore wings; subterminal small black spots; terminal black points.

Expanse 31 mm.

Hab. Juan Vinas.

Allied to *C. lacteigera*, Btl., which is smaller and without any reddish shades.

Capnodes penelope, sp. n.

Head, thorax, and wings fuscous brown. Abdomen dark fuscous. Fore wings: darker antemedial and postmedial lines starting from fine whitish streaks on costa, the postmedial with minute white points on veins; a darker patch in place of reniform; a small bluish-grey spot near base below cell, and a large similar spot beyond postmedial above submedian; a subterminal row of small white spots; similar terminal spots below vein 4; white spots on fringe. Hind wings: a medial line similar to postmedial on fore wings; subterminal and terminal white spots. Underneath: fore wings fuscous; a medial white spot on costa; hind wings paler with a medial and broad marginal fuscous shade, and a dark streak on discocellular.

Expanse 24 mm.

Hab. Juan Vinas.

Capnodes memoranda, sp. n.

♂. Head dark grey. Collar brown, anteriorly edged with white. Thorax grey posteriorly speckled with black. Abdomen above brown, changing to grey on last segment; anal hairs buff and grey. Wings brown. Fore wings: some grey at base limited by a black basal line; a dark brown, geminate, wavy, antemedial line; a similar postmedial line, geminate only on costa; the outer third of wing filled by a large oval grey space, edged by a black line incurved from apex, and outwardly by the terminal black line which is intercepted by the veins; this space does not reach the costa nor submedian vein, and is crossed by a dentate and wavy line dark anteriorly, whitish below vein 4 and followed by a diffused brownish shade. Hind wings: a fine dark line on discocellular; a dark geminate medial line lunular dentate; a subterminal row of white points; marginal white points between vein 4 and anal angle; a large greyish patch at anal angle, and a smaller similar marginal patch at vein 4. Underneath buff, irrorated with fuscous; broad subterminal fuscous shades; a medial shade and discocellular streak on hind wings; an orbicular point on fore wings.

Expanse 37 mm.

Hab. Tuis.

Allied to *C. orbiculata*, Feld., and *C. restricta*, Brebant, but quite distinct.

Capnodes amalthea, sp. n.

♂. Head and thorax brown. Abdomen fuscous above. Wings brown. Fore wings: fine geminate antemedial and postmedial lines, dark grey, lunular and indistinct; a black medial point in cell; a fine subterminal dark line, incurved from apex, then nearly straight to tornus, terminating below vein 3 in a wavy white line; from vein 2 to 8 the subterminal is followed by a greyish irregular shade; an interrupted terminal fuscous line. Hind wings: a dark streak on discocellular; a geminate finely wavy dark medial line; some greyish subterminal shades chiefly towards anal angle.

Expanse 30 mm.

Hab. Juan Vinas.

Capnodes rubida, sp. n.

Head, collar, and thorax brown. Abdomen greyish fuscous above. Wings light brown. Fore wings: an antemedial dark irregular white line, inwardly edged with crimson, and

outwardly broadly shaded with red, which extends in cell between orbicular and reniform which are black ; a postmedial red line, broad on costal margin, and divided by a white line from costa to between veins 6 and 7, below which it is inwardly partly edged with black ; an irregular subterminal black shade, most heavily marked from vein 4 to costa and below vein 2. Hind wings: a dark point in cell ; a medial red line partly edged with black and divided by a white line between veins 2 and 4 ; terminal dark lines on both wings.

Expanse 23 mm.

Hab. Sixola River, Juan Vinas.

Capnodes perornata, sp. n.

♂. Palpi, head, collar, and thorax brown. Abdomen fuscous above. Wings lilacine fuscous slightly tinged with brown. Fore wings: an antemedial silvery white band edged and divided by a rust-brown line, which is geminate between vein 2 and submedian ; the median, vein 2, and submedian also rust-brown where crossing this white band ; some minute and indistinct rust-brown spots medially below cell ; a dark transverse line across cell near its end ; a silvery white space beyond cell from vein 5 to 7, crossed by two rust-brown lines, surmounted by a white spot on costa, and followed by white and rust-brown spots to apex ; black marginal points between the veins. Hind wings a trifle paler ; a dark medial line outwardly shaded with a little rust-brown ; an indistinct geminate subterminal dentate shade ; marginal black points as on fore wings.

Expanse 25 mm.

The ♀ has the white spots extended medially between vein 2 and cell, and small spots between 3 and 4, and 4 and 5, thus connecting with the white space above vein 5.

Expanse 27 mm.

Hab. Tuis, Sixola.

Capnodes rubrilinea, sp. n.

♂. Palpi brown-grey, some red on third segment. Head red ; some brown on vertex. Collar brown with two crimson spots. Thorax and abdomen above greyish fuscous, some brown on patagia anteriorly. Fore wings: base dark brown on costa, grey-brown below cell, a small red spot on costa ; a broad antemedial white band, nearly straight inwardly, four times incurved outwardly, irrorated with crimson and divided by a brown and red shade from costa to median vein ;

medial space brown shaded with slate-grey on veins; orbicular small, dark; reniform large, slate-grey, edged with dark brown; postmedial line curved beyond cell, finely dentate and lunular, crimson, divided by a white line from costa to vein 7, and followed on costa by a red spot, and between veins 6 and 8 by a larger red space irrorated with white: an irregular subterminal slate-grey shade; a terminal wavy black line inwardly shaded with slate-grey; fringe slate-grey divided by a straight black line. Hind wings lighter brown with a few dark irrorations; a dark spot on discocellular; a postmedial dentate crimson line divided by a fine white line from vein 5 to inner margin; outer margin and fringe as on fore wings. Underneath buff irrorated with brown, the discal spots round and conspicuous; the orbicular also marked by a dark point.

Expanse 32 mm.

Hab. Juan Vinas.

Capnodes agrestis, sp. n.

♀. Head, collar, and thorax brown tinged with lilacine. Abdomen above fuscous. Wings lilacine brown; the lines brown, not very distinct. Fore wings: the antemedial slightly curved with buff points on veins; a medial line curved around discocellular; the postmedial outcurved below costa, outwardly shaded with light brown, and with buff points on veins; a subterminal irregular row of black spots shaded with white; a faint zigzag terminal dark line; pale costal points towards apex. Hind wings: a postmedial straight buff line outwardly shaded with reddish brown, and followed by a broad grey shade from vein 6 to inner margin, outwardly finely lunular and containing some black and light brown spots.

Expanse 36 mm.

Hab. Juan Vinas, El Sitio.

Capnodes amarga, sp. n.

♂. Palpi, head, and collar fuscous. Thorax lilacine brown. Abdomen fuscous above, buff underneath. Wings light brown faintly tinged with lilacine. Fore wings: the costa broadly lilacine fuscous; the outer margin below vein 7 darker, also the outer portion of inner margin; the lines dark; a basal line; the antemedial partly geminate, followed by a dark point in cell; the postmedial dentate, lunular, geminate; a subterminal white line, interrupted from vein 6 to inner margin; dark terminal points between the veins.

Hind wings similar, but without an antemedial line, a dark spot in place of it; the subterminal white line from costa. Underneath buff-brown: fore wings with a black point in cell; a streak on discocellular suffusing with straight postmedial line; a brown subterminal shade. Hind wings: a large dark cellular point followed by a geminate dark shade; the outer margin broadly dark.

Expanse 35 mm.

Hab. Guapiles, Port Limon.

Capnodes tuva, sp. n.

♂. Palpi outwardly reddish brown, inwardly ochreous, the third segment ochreous at base. Head and collar dark reddish brown. Thorax similar in front, posteriorly dark violaceous fuscous. Abdomen dark fuscous. Fore wings violaceous brown, thinly irrorated with metallic-blue scales; the lines buff edged with reddish brown, both very slightly curved; an irregular row of dark subterminal spots outwardly shaded with lilacine-blue; a terminal dark line slightly lunular between veins and inwardly shaded with bluish scales; very minute white costal points before apex; an ovate dark line at end of cell. Hind wings browner in tint; a dark spot on discocellular; the postmedial line, subterminal spots, and terminal line as on fore wings. Underneath fuscous brown; a darker postmedial line, starting from a small buff spot on fore wings.

Expanse 32 mm.

Hab. Tuis, Juan Vinas, Carillo.

Capnodes tuisa, sp. n.

Palpi brown, the base and tip of third segment pale buff. Head and collar brown. Thorax violaceous brown. Abdomen fuscous. Fore wings dark violaceous fuscous; the antemedial line wavy, still darker, inwardly shaded with reddish brown, and with a white point on costa and on submedian; the postmedial finely lunular, outwardly shaded with light reddish brown, with a larger white spot on costa and a white point on submedian; an irregular fine subterminal line with grey buff points on veins; a dark terminal line with light brown points between the veins and whitish points on costa towards apex. Hind wings violaceous fuscous; a dark point on discocellular; a dark finely wavy medial line from vein 7 to inner margin near angle, outwardly edged with buff, and followed by a broad greyish-buff space irrorated with brown, and with some postmedial blackish spots, chiefly near inner

margin; the terminal line as on forewings. Underneath: fore wings fuscous brown; a dark spot on discocellular; a postmedial straight dark line, starting from a buff costal spot. Hind wings luteous, the outer margin shaded with fuscous especially at apex; a discocellular spot and dark medial line. A male from Guapiles has the pale shadings on hind wings entirely suffused with brown.

Expanse 30 mm.

Hab. Tuis, Carillo.

Capnodes abstrusa, sp. n.

♂. Palpi, head, and collar brown. Thorax dark violaceous fuscous. Abdomen dark fuscous. Wings dark violaceous fuscous. Fore wings: two light brown patches on costa at origin of antemedial and postmedial lines, which are light brown edged with dark brown, and end in a small white dot on inner margin; the antemedial forming two slight curves; the postmedial curved beyond cell; a light brown terminal line slightly curved between veins and preceded by light brown shades; four white points on costa before apex. Hind wings: a large light brown space on outer half from vein 6 to tornus, outwardly dentate near tornus and crossed by a dentate dark subterminal shade; the basal portion of light space is curved from cell to anal angle, and is crossed by a postmedial brown shade; a terminal pale line as on fore wings inwardly shaded with dark brown between it and the pale space. Underneath fuscous brown, the hind wings with the basal two-thirds paler; a dark discocellular streak and a dark medial shade slightly angled beyond cell.

Expanse 35 mm.

Hab. Juan Vinas.

Closely allied to *C. sufficiens*, Walk.

Capnodes apicata, sp. n.

♂. Head and thorax grey-brown, the palpi irrorated with whitish scales. Abdomen grey-brown, with paler lines posteriorly on segments; dark subdorsal tufts on third and fourth segments; anal hairs dark brown. Fore wings greyish brown, the lines fine, dark brown; the basal line faint; the antemedial wavy, incurved in cell, and inwardly shaded with buff-brown; a geminate dark medial shade; the postmedial straight to subcostal, then angled and slightly oblique to inner margin, shaded on both sides with buff-brown; a dark point in cell beyond antemedial line and another on medial shade; the outer margin dark brown,

except a broad costal space to apex and a patch at tornus, which are grey-brown. A subterminal indistinct darker shade and terminal dark spots between the veins. Hind wings: the basal area darker to a medial blackish line, beyond which the wing is light brown, crossed by a wavy black postmedial line, and a subterminal geminate dark dentate shade, inwardly shaded with greyish towards inner margin; terminal dark spots between veins.

Expanse 37 mm.

Hab. La Florida, Sixola.

Bendis tremularis, sp. n.

Head, collar, and abdomen brownish grey. Thorax and fore wings grey. Fore wings: lines dark brown; a point at base of cell; antemedial fine wavy, inset on subcostal and outwardly curved; a black point as orbicular; a dentate medial line; postmedial fine, outcurved, and wavy; reniform indistinct, inwardly edged by a dark brown velvety line and with a small yellow spot posteriorly; an irregular row of indistinct subterminal brownish spots; marginal black points; the wing slightly darker about tornus. Hind wings dark brown; a straight line from apex to anal angle separates the outer margin which is whitish grey; the antemedial and medial lines wavy, black.

Expanse 36 mm.

Hab. Tuis.

Focilla proba, sp. n.

♀. Palpi black irrorated with white and broadly circled with black at tips. Head, collar, and thorax rust-brown; two white lines on frons. Abdomen fuscous brown. Wings rust-brown, the lines darker. Fore wings: the base darker with a few white irrorations on costa; a faint basal line; the antemedial wavy, crossing the orbicular which is very small; the medial line dentate on costa, finely wavy below cell; the reniform large, round, black; the postmedial outcurved around cell, finely wavy; the subterminal shade inwardly oblique from costa to below vein 6, then slightly outcurved to vein 2, but still inwardly oblique, followed by a parallel dark shade, bifurcating along vein 7 and irregular to apex; a marginal row of black points and lilacine irrorations from veins 5–6. Hind wings: a medial black wavy line; two antemedial and two postmedial dark shades; the marginal black points united by a wavy dark line near anal angle. Underneath light brown irrorated with fuscous; the subterminal shades very marked; the postmedial line very fine.

The fore wings have the apex acute, the outer margin very nearly straight to vein 4, then angled and inwardly oblique; the hind wings are produced at vein 4.

Expanse 40 mm.

Hab. Tuis.

A specimen from La Florida is paler without any dark shadings; the subterminal on fore wings obsolescent below vein 5. Underneath there are no dark subterminal shades.

Focilla pallidipes, sp. n.

Body brown tinged with lilacine. Legs brown; tarsi creamy yellow; a white spot at joint of femora and tibia. Wings brown tinged with lilacine, palest on outer margin. Fore wings: a fine basal and antemedial paler line, outcurved on costa, then nearly straight to inner margin, the former inwardly edged with darker brown, the latter outwardly so marked; the orbicular small, round, edged by a pale line; a nearly straight finely geminate dark medial line, outwardly more heavily dark shaded; reniform large, lighter brown with some white points and scaling; the postmedial pale, inwardly shaded with darker brown, outcurved and very wavy to vein 3, then inset from below reniform, outwardly oblique to submedian fold, and again inset and outwardly oblique to inner margin near tornus; the subterminal inwardly curved from costa before apex to vein 3, then inset, wavy to tornus, pale, inwardly shaded with dark brown, and interrupted by some black marks near costa; marginal white points between the veins; a dark terminal shade from vein 4 to tornus, which is continued on hind wings as a straight line from apex to anal angle and is followed on hind wings by a buff and lilacine shade separated by a fine darker line; marginal white spots, largest near anal angle. Underneath lilacine brown; a wavy fine black postmedial line irregularly shaded outwardly with buff; short white discocellular streaks; marginal white points; fore wings with the orbicular well marked, and a subterminal white spot between veins 6 and 7. The fore wings are produced at apex and vein 4, very oblique below 4; the hind wings are produced at veins 6 and 4, and are otherwise rather crenulate.

Expanse 45 mm. A rather small specimen.

Hab. Tuis.

Focilla sublignaris, sp. n.

Palpi: the second segment outwardly brown, inwardly buff; the third segment buff circled with light brown near

tip. Fore wings slightly produced at apex and veins 4–5, otherwise crenulate. Hind wings crenulate, slightly produced at vein 4. Head, collar, and thorax brown. Abdomen fuscous brown above. Legs with long grey hairs; tarsi brown, inwardly paler. Fore wings dull brown, shaded with blackish grey on outer margin; the basal line black, outwardly edged with white; the antemedial lunular black, inwardly edged with white; the orbicular round, black circled with white; a dentate lilacine brown shade medially from cell to inner margin, preceded and followed by darker brown; the reniform large outlined with white, filled in with light and dark brown; a blackish dentate line from below reniform to inner margin, slightly edged with white; the postmedial wavy and nearly straight to inner margin, followed by white and lilacine shades on costa to near apex; a diffuse dark subterminal shade and marginal black points. Hind wings: the postmedial space below cell lighter brown; the black antemedial line followed by a light brown shade; the medial black, geminate on costa, coalescing below cell to inner margin; the subterminal geminate, the outer part very broad from vein 5 to inner margin; the outer margin blackish from vein 4 to anal angle. Underneath dark grey, irrorated with white and with oblique darker shades and wavy lines; the postmedial outwardly shaded with white; the fore wings have the basal half above fold nearly white with a few dark irrorations; the costal margin beyond postmedial and above vein 6 thickly irrorated with white.

Expanse 42 mm.

Hab. Tuis.

Focilla terraba, sp. n.

Body and wings lilacine brown. Fore wings: outer margin deeply incurved between apex and vein 4, then oblique and faintly crenulate; a faint black basal line; antemedial fine, black, consisting of clusters of scales inset in cell; a small black spot as orbicular; a wavy, geminate, black medial line; reniform large, indistinct, partly outlined with white; postmedial very fine, black, wavy, outcurved to vein 3, then inset below reniform; outer margin below vein 7 shaded with grey; an oblique black streak from vein 6 tapering to vein 3; a short streak above it from 7–5; from vein 3 to tornus the margin terminally blackish, on which the marginal points are yellow; above vein 3 the marginal points are white shaded with black. Hind wings produced at veins 7 and 4, also crenulate; a straight roseate line from apex to anal angle, preceded by a broad black shade, and

followed by lilacine grey crossed by a paler line; outer margin lilacine grey above vein 4, below it brown with the marginal white spots much larger; the antemedial and medial lines indistinct. Underneath the outer margins are broadly shaded with lilacine grey, obsolescent at apex and between 3 and 5 on fore wings; the postmedial partly edged with white.

Expanse 37 mm.

Hab. Terraba.

Focilla perplexa, sp. n.

♀. Body above brown, the thorax tinged with lilacine; underneath greyish buff. Wings greyish brown tinged with lilacine. Fore wings: basal, antemedial, and postmedial lines fine, blackish irrorated with grey; a medial brown line, geminate below cell; a broad wavy reddish-brown subterminal shade, preceded on costa by lilacine and white irrorations; marginal black points connected by a fine lunular line; orbicular a black point; reniform outlined by a brown line and two short buff streaks below. Wings angled at vein 4. Hind wings: an antemedial black line; medial line irregular, black outwardly edged with grey; a broad subterminal reddish-brown shade from below vein 7 to inner margin, really a geminate line filled in with paler reddish brown; marginal black points followed by a fine dark line; margin slightly produced at vein 4. Wings below greyish buff, irrorated with black except on inner margin of hind wings; a black medial line thickening near inner margin; a fine black postmedial line outwardly edged with white; a dark subterminal shade, a subapical black spot on fore wings.

Expanse 35 mm.

Hab. Sixola.

The male is similar to the female, but slightly paler.

Focilla inconstans, sp. n.

♂. Body above and wings fulvous brown. Body below greyish white. Fore wings: the lines black; a basal line on costa outwardly edged with white; the antemedial oblique on costa, then inset, lunular to inner margin, inwardly irrorated with white; a black point as orbicular; the medial line wavy, straight; the reniform large, greyish buff crossed by a fine dark line; the postmedial outcurved and wavy, partly shaded with grey; a faintly darker shade between medial and postmedial; subterminal shade broad, darker

brown, straight from costa, very faint below vein 4; marginal black points; outer margin angled at vein 4. Hind wings: a fine antemedial line; medial line black, irregular, outwardly edged with grey; subterminal indistinct, geminate, finely wavy; marginal black points; wing produced at vein 4. Wings below greyish buff, irrorated with light brown; black discal points; medial and postmedial lines very fine, wavy; subterminal indistinct, broken into spots.

Expanse 34 mm.

Hab. Guapiles.

Focilla vulgaris, sp. n.

♀. Head and thorax brown. Abdomen fuscous. Fore wings dull brown, tinged with grey on basal third and postmedial space; the antemedial line fine, wavy, brown; a velvety-black point as orbicular; a small brown spot on costa above orbicular; outer portion of medial space to postmedial line clearer brown, on which the reniform stands out distinct; reniform grey-brown, edged below by a buff line; postmedial fine, dark brown, outwardly edged on costa with light brown; subterminal line fine, buff, deeply dentate, indistinct below vein 6, separating the greyish postmedial space from the brown outer margin; a subterminal oblique buff line between 6 and 8 inwardly shaded with velvety black-brown, and followed by a similar shade to apex; a wavy terminal brown line. Hind wings greyish brown; an antemedial brown shade and a medial brown line; a slightly curved brown shade from outer margin at vein 5 to anal angle, where it is broader and followed by a yellowish-white line. Wings below dull brown, irrorated with white especially on hind wings; a fine postmedial line partly shaded with white; a marginal small white spot between 6 and 7 on fore wings. Fore wings incurved from apex to vein 4; hind wings produced at vein 4 and crenulate to anal angle.

Expanse 37 mm.

Hab. Tuis.

A widely distributed species.

Focilla nescia, sp. n.

♀. Body and wings brown, faintly tinged with lilacine. Wings faintly produced at vein 4. Fore wings: the lines dark brown; a basal line on costa outwardly edged with white; the antemedial oblique on costa, inset and outcurved from subcostal vein, then outwardly oblique below submedian, inwardly edged with white on costa, at subcostal, and at sub-

median; medial line wavy, inbent on inner margin; postmedial wavy, incurved at vein 3, outwardly edged with clear white on costa to vein 6, and followed by lilacine irrorations between 6 and 8; outer margin below vein 4 very dark brown, on which a subterminal dark line is barely discernible; above vein 4 the outer margin is fuscous grey irrorated with lilacine, especially on vein 5 and fold above it; a subterminal light brown line from vein 6 to costa, inwardly preceded by a dark brown shade; marginal dark points above vein 4. Hind wings: antemedial and medial black lines, the latter outwardly edged with white on inner margin; the postmedial shade more of a reddish brown followed by a finer subterminal shade; marginal black spots partly connected by a dark lunular line. Underneath duller brown; the postmedial line partly edged with white, a dark medial line, a subapical white spot on fore wings, and the outer margin lilacine below vein 4; hind wings with outer margin broadly lilacine.

Expanse 38 mm.

Hab. Sixola.

Focilla onusta, sp. n.

♂. Body and wings rich brown, the latter faintly tinged with purple. Pale lateral spots on abdomen except on two last segments. Fore wings: the basal third thinly irrorated with white; the lines dark brown; a basal line on costa outwardly edged with light brown; the antemedial wavy, not oblique, inwardly edged with light brown, chiefly on costa; a medial dark line, geminate below cell; the postmedial wavy, slightly outcurved, finely edged with light brown outwardly; the reniform outlined in light brown; a subterminal fuscous shade projecting towards margin between veins 6 and 7; the outer margin above vein 3 lighter brown; dark marginal points and short transverse streaks; fringe fuscous brown; wings slightly angled at vein 4. Hind wings: antemedial, medial, postmedial, and subterminal dark shades, the medial followed by a light brown dentate line from below cell to inner margin. Margin produced at vein 4 and slightly crenulate from that point to anal angle. Wings below lighter brown; antemedial and postmedial line well marked; medial and subterminal shades less defined; black points in cell and on outer margin; a large subterminal black spot on fore wings between 6 and 7.

Expanse 45 mm.

Hab. Tuis.

Focilla deterrima, sp. n.

Body and wings fuscous brown faintly glossed with blue and violaceous. Fore wings: the lines black, irregular, almost imperceptible; an antemedial, medial, and postmedial line, the latter only slightly outcurved; the subterminal only visible from vein 5 to tornus, consisting of four fine wavy lines; marginal black points; the reniform consisting of a dark annular line; fringe light brown tipped with white. Hind wings: the antemedial and postmedial lines nearly straight and broad; the medial line finely wavy irrorated with grey; from angle at vein 4 to anal angle the fringe is black, above vein 4 as on fore wings. Wings below light brown; a black point in cell; a medial and a postmedial black line, the latter outwardly edged with white in places; a subterminal dark shade on hind wings; marginal black points.

Expanse 39 mm.

Hab. Tuis.

Focilla laloides, sp. n.

Head, thorax, and wings dark brown tinged with purplish, and thinly irrorated with white scales. Abdomen fuscous brown above. Fore wings: the lines darker; the antemedial dentate and lunular, mottled with grey; a medial line greyish on costa only, slightly wavy followed by a fine paler shade; the postmedial fine dentate lunular, outcurved around cell, followed by a broad bluish-grey shade irrorated with white on costa; a light brown subterminal shade, flecked with white towards costa, broadly shaded with fuscous brown, inwardly on costa and outwardly at tornus; the outer margin shaded with grey and thickly irrorated with white between veins 3 and 5; a marginal row of black points; reniform large, round, grey; fringe brown, tipped with white. Hind wings darkest on outer margin; a dark medial line; an irregular postmedial line irrorated with grey below vein 6 and followed by a broad bluish-grey shade. Underneath light brown irrorated with dark brown; antemedial and postmedial lines; a geminate subterminal dark shade; black marginal points; the costal margin of fore wings broadly greyish.

Expanse 41 mm.

Hab. Tuis, Juan Vinas.

The sexes absolutely similar.

The species is allied to *F. lola*, Druce.

Mazacyla subpicta, sp. n.

♂. Head and thorax reddish brown; the patagia tipped with white scales. Abdomen fuscous; some reddish-brown hairs subdorsally at base. Wings ochreous brown, irrorated with darker scales, the lines black. Fore wings: apex acute, outer margin rounded; a fuscous basal shade; the antemedial oblique on costa, then inset, nearly straight; orbicular a round black spot; medial line straight to below cell, then slightly outbent; reniform large, white, oval, containing a black streak and some brown scales; postmedial fine, incurved below reniform; a few subterminal black spots, chiefly near costa; marginal black points, fringe dark brown. Hind wings faintly angled at vein 4; fine antemedial and medial lines; postmedial shade indistinct, closely followed by a dentate subterminal shade; a greyish tinge between these two becoming white at inner margin; marginal black points connected by a wavy black line faintly edged with grey. Fore wings below: the base, apex, and tornus yellowish white, otherwise light brown; some black irrorations; a velvety black spot as orbicular; a dark brown irregular medial line; reniform whitish, marked as on upper side; a broad brown shade below reniform; the postmedial white, edged with black on costa, not incurved below reniform; a subterminal dentate whitish line, and a black spot near apex. Hind wings below: the base and outer margin broadly yellowish; a large yellowish spot at end of cell similar to reniform, closely followed by the dark medial line; a broad brown space to postmedial, which is fine, black, slightly irregular; a dentate subterminal line; terminal brown shading between vein 4 and anal angle.

Expanse 42 mm.

Hab. Sixola.

Anomis directilinea, sp. n.

♀. Head and thorax red mottled with a few yellow hairs. Abdomen fuscous grey; some red hairs subdorsally at base. Fore wings red, thinly irrorated with yellow scales; veins greyish; costal margin tinged with lilacine; antemedial line purplish red, oblique from costa, nearly straight; a darker purplish-red line from subcostal outwardly edged with grey across discocellular and straight to inner margin; the postmedial outcurved, wavy to base of vein 3 at medial line; a white point as orbicular; a white point at base between 4 and 5 as reniform; a subterminal purplish-red shade intercepted by the veins. Hind wings fuscous; fringe fuscous

mottled with reddish brown and a few white scales. Fore wings below fuscous brown, the outer margin paler; the costa tinged with red and irrorated with white; a postmedial distinct black line. Hind wings below violaceous brown irrorated with white; a pale streak on discocellular; a finely wavy black postmedial line.

Expanse 44 mm.

Hab. Juan Vinas.

Anomis rubida, sp. n.

♀. Head, thorax, and fore wings red. Abdomen and hind wings fuscous brown. Fore wings: the lines light brown irrorated with white; a white spot at base of submedian; the antemedial oblique wavy, outset below median vein; a wavy medial line from submedian; the postmedial twice outcurved to vein 3, then along vein 3 to reniform; orbicular small, grey, edged with brown; the reniform consisting of two superposed coalescent spots, edged with brown and containing brown points; subterminal dark spots outwardly shaded with white; fringe on both wings light reddish. Fore wings below fuscous brown; the costal margin reddish irrorated with white; postmedial distinct on costa only; outer margin below vein 5 light brown; the inner margin luteous. Hind wings below reddish brown irrorated with white; a wavy postmedial line; a subterminal dark shade.

Expanse 40 mm.

Hab. Juan Vinas.

Anomis barata, sp. n.

♂. Head and thorax brown tinged with violaceous. Abdomen fuscous; a pale sublateral line; anal hairs whitish. Fore wings brown slightly tinged with red; a white spot and fuscous hairs at base below cell; lines dark reddish brown edged with light brown and slightly irrorated with white scales; the antemedial wavy, oblique from costa to near middle of inner margin; the medial from cell, sinuous; the postmedial wavy, twice outcurved to vein 3; orbicular as a white point; reniform consisting of two superposed coalescent spots, purplish black containing a few white scales; an interrupted subterminal fuscous shade. Hind wings dull brown; fringe greenish brown. Hind wings below purplish brown irrorated with white; a finely wavy dark postmedial line outwardly shaded with whitish.

Expanse 42 mm.

Hab. Juan Vinas.

Anomis patagiata, sp. n.

♂. Head and thorax fulvous brown tinged with lilacine; the patagiæ produced, reaching third segment of abdomen. Fore wings reddish brown; a tuft of brown hairs above submedian near base; a white point at base; the lines dark reddish brown irrorated with white similar to *A. rubida* and *A. barata* described above; the orbicular as a dark shade containing a white point; reniform large, white, constricted anteriorly and crossed by a brown streak; a subterminal dark shade broken into spots between veins 2 and 5; terminal light brown points; fringe tipped with white. Hind wings fuscous brown; a terminal darker crenulate line, leaving interspace and fringe buff. Hind wings below reddish brown, the inner margin broadly fuscous brown, irrorated with white; a white point on discocellular; a dull reddish postmedial line, outwardly edged with white.

Expanse 40 mm.

Hab. Juan Vinas.

Anomis rufescens, sp. n.

♂. Head and thorax purple-red; the patagiæ very tufted, tipped with black. Abdomen above fuscous; sublateral buff spots connected by a faint buff line. Fore wings: costal margin olivaceous brown irrorated with white; base below cell and inner margin below submedian purplish; cell medially, and space between median and submedian from near base to subterminal, bright red; lines grey edged with purple; antemedial slightly wavy, hardly oblique; medial faintly incurved from below reniform; postmedial outcurved from 8–6 and outwardly truncate between 5 and 4; a broad subterminal fuscous shade, outwardly edged with light brown; outer margin dark reddish brown, crenulate; orbicular a white point on a purple shade; reniform an interrupted white line on discocellular. Hind wings dark fuscous brown; fringe black mottled with white scales.

Expanse 39 mm.

Hab. Tuis, Juan Vinas.

Anomis innocua, sp. n.

♂. Head and thorax dull lilacine brown, a tuft of grey hairs on vertex. Abdomen fuscous; anal hairs ochreous. Fore wings dull lilacine brown; the lines fine, darker, edged with dark grey; the antemedial wavy, slightly oblique; the medial nearly straight; the postmedial twice outcurved to

vein 3; a broad fuscous subterminal shade; a small reddish medial shade above submedian, extending beyond medial line; outer margin shaded with fuscous; orbicular a white point surrounded by a darker shade; reniform large, diffuse, dark brown, with a grey line on discocellular. Hind wings dark fuscous brown; a black shade on discocellular; fringe fuscous spotted with white.

Expanse 30 mm.

Hab. Sixola.

Allied to *A. fornax*, Gn.

Anomis umbrata, sp. n.

♂. Wing shape as in *A. xylina*, Say. Head and thorax lilacine brown. Abdomen fuscous; a white lateral line; anal hairs buff. Fore wings fulvous brown, tinged with violaceous to reniform and near tornus; costal fold brownish irrorated with white; lines dark, partly edged with grey; antemedial from median, preceded in cell by some white scales; medial from below cell, inversely wavy to anteme lial; postmedial to vein 4, twice outcurved; orbicular a white point; reniform large, diffuse, dark, with an interrupted greyish line on discocellular; a straight purplish shade from reniform to near tornus; traces of a darker subterminal shade from costa to vein 3.

Expanse 36 mm.

Hab. Sixola.

One specimen of this species has the reniform almost entirely white.

Orœsia striolata, sp. n.

♀. Palpi brown. Head and collar shaded with ochreous. Thorax and abdomen fuscous. Fore wings greyish lilacine, on basal half numerous lines inwardly oblique from costa to inner margin, brown shaded with bronze; a broader bronze shade across discocellular and oblique to middle of inner margin; the postmedial consisting of three fine lines angled below costa and inwardly oblique, the innermost line contiguous to bronze shade below vein 5; the postmedial crosses a darker lilacine shade below costa and between veins 2 and 4; a dark line shaded with bronze from apex to inner margin, the bronze shading replaced by silvery gold between veins 2 and 5; the terminal portion of inner margin broadly bronzed; the outer margin lilacine, with darker striæ and a terminal bronze shade below apex. Hind wings fuscous.

Expanse 36 mm.

Hab. Tuis, Juan Vinas.

Plusiodonta nitissima, sp. n.

Palpi white, outwardly shaded with brown. Head: frons white; vertex ochreous brown, with a dark projecting tuft. Collar and thorax ochreous brown, shaded with dark brown and irrorated with lilacine scales. Abdomen fuscous grey above, whitish underneath, irrorated with grey. Fore wings light brown, with darker lines and shadings; a lilacine basal line; the antemedial space broadly silvery golden, thickly irrorated with brown in cell and just below it, also on submedian; the costa finely dark grey; the medial space dark, extending to apex, forming a triangle of which the base is along a wavy line extending from below apex to lobe on inner margin, shaded with lilacine along costa, and with wavy, transverse, lilacine medial lines; an inwardly oblique dark shade from below reniform to lobe; the reniform consisting of wavy lines and some golden scales; some golden scales also medially below cell; the postmedial partly shaded with lilacine; a large silvery-golden space on outer half of inner margin extending slightly above vein 2, and a smaller similar space beyond postmedial between veins 3 and 5; a fine subterminal line outcurved to 6, then incurved across this latter golden space, rounded and deeply incurved across the golden space on inner margin; three submarginal black spots above tornus, and some golden spots above vein 3, outwardly shaded with black from vein 4 to 7; an interrupted marginal lilacine shade and terminal line. Hind wings fuscous grey.

Expanse 39 mm.

Hab. Tuis.

Plusiodonta miranda, sp. n.

Palpi reddish brown. Head and thorax brown. Collar golden brown, all irrorated with lilacine. Abdomen fuscous grey. Fore wings golden brown; from base of costa and inner margin to lobe lilacine grey, limited by a fine oblique whitish line; a dark streak on costa and below cell, and one in cell more outset, followed by another on costa beyond; from before middle of subcostal an inwardly oblique dark shade to submedian; the outer portion of inner margin to near tornus shaded with lilacine; the medial space slightly tinged with lilacine; the costal margin from before middle to near apex shaded with lilacine; reniform duller brown; a black line from outer margin along vein 7 and incurved to a golden-yellow postmedial spot on vein 2; an ovate black line from tornus to near vein 3; two other fine lines curved posteriorly and meeting below vein 3 extend, the inner one

to costa, the outer one to outer margin at vein 7; some terminal lilacine shading; fringe greyish brown, tipped with whitish from apex to vein 3. Hind wings fuscous grey; fringe tipped with whitish.

Expanse 38 mm.

Hab. Juan Vinas.

Gonodonta pulverea, sp. n.

♀. Palpi grey, tipped with white. Frons and vertex white. Collar and thorax lilacine grey, scales on latter tipped with white. Fore wings: the costal margin and cell brownish; below cell and outer margin lilacine grey, irrorated with brown; an indistinct brown basal line and fine antemedial line, the latter meeting on inner margin a more distinct medial line, obliquely incurved below cell; reniform light brown, edged with whitish and containing a few black scales; the postmedial fine, wavy, partly shaded with dull golden brown, hardly perceptible; a lunular subterminal line, indistinctly edged with white; a lunular submarginal line, shaded in places with white. Hind wings fuscous brown.

Expanse 38 mm.

Hab. Tuis.

Gonodonta sitia, sp. n.

Palpi, head, and thorax dark brown, glossed with lilacine. Abdomen black above; anal hairs buff. Fore wings dark olivaceous brown; a black point near end of cell; two darker antemedial lines from inner lobe, outwardly oblique, the basal line partly edged inwardly with white; a medial line of lilacine scales between vein 2 and submedian; a postmedial dentate buff line from vein 5 to 2, preceded and followed by lilacine scales; the lobe at tornus reddish brown, preceded by a geminate reddish-brown line on inner margin; lilacine irrorations on outer margin separated by vague brown lines; fringe grey. Hind wings black; a medial bright yellow band from costa across two-thirds of wing.

Expanse 41 mm.

Hab. El Sitio.

Gonodonta avangareza, sp. n.

Palpi white in front and above, laterally brown. Frons and vertex white. Collar anteriorly brown, posteriorly dark reddish brown, with a row of lilacine scales. Thorax dark reddish brown. Abdomen above black. Fore wings brown,

palest on outer margin ; the lobe near base of inner margin dark reddish brown, and a similar streak above vein 2 to postmedial; some lilacine white irrorations on costa and below cell at base, and also on a vague antemedial dark wavy line ; the postmedial black, divided by a line of lilacine irrorations, slightly oblique from costa to submedian near tornus ; some fine medial reddish-brown lines ; a curved brown line beyond postmedial, followed by darker lunular lines, becoming dentate towards tornus, the costal margin apically shaded with reddish brown. Hind wings black; a broad orange band from base along costa, then curved medially across two-thirds of wing.

Expanse 37 mm.

Hab. Avangarez.

Gonodonta lecha, sp. n.

Palpi and head whitish grey. Collar and thorax grey. Abdomen deep yellow above, buff-white underneath. Fore wings dark silky brown ; the costal margin white, tinged with light brown along extreme costa ; the base to below cell pale olivaceous brown ; a grey-white streak along base of inner margin ; the sinus bordered with lilacine grey ; a straight subterminal pale line from vein 9 to tornus, followed by light brown and lilacine grey, on which are indistinct lunular lines and submarginal points; a velvety black point on discocellular anteriorly. Hind wings orange-yellow ; the outer margin broadly black, narrowing to a point near anal angle. Underneath the hind wings are yellowish without markings, or with only a little black on outer margin.

Expanse 38 mm.

Hab. Avangarez.

Closely allied to *G. sinaldus*, Gn., but easily distinguished by the subterminal line and paler costa and the different hind wings.

VI.—*A Synoptical Revision of the Dynastid Genus* Lonchotus. By Gilbert J. Arrow.

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I described in 1908 two new species of the Madagascan genus *Lonchotus*. Only two species were previously known, *L. lentus*, Burm., and *L. lateretusus*, Fairm., the latter being

apparently (*cf.* Felsche, Deutsche ent. Zeitschr. 1906, p. 350) the form long before described from the female by Klug as *Geotrupes crassus*. I now raise the number of known species to nine, by the addition of five new species, the types of all of which are in the British Museum. All have a close external resemblance, but, as is frequently found in such cases, the genitalia of the males show strongly marked differences. The females are very difficult to distinguish, but the following table of the species will, I hope, prove sufficient for the discrimination of both sexes.

The genus is related to *Dipelicus*, but is quite distinct and remarkably homogeneous. It is practically confined to Madagascar, and it is remarkable that, although systematic collecting has now been carried out in most of the numerous small islands of the Mascarene region, the little coral island of Astove, about 150 miles north-west of the northern end of Madagascar, is the only one in which this genus has been discovered, while the form occurring in that island is a very distinct one which certainly cannot be regarded as of late evolution. Specimens of *Lonchotus lentus* from the Dejean Collection now in the British Museum were said to come from the Ile de France ; but this has not been confirmed, although it has many times been brought from Madagascar. Dr. Sicard has it from Ivondro.

The majority of the species inhabit the northern part of their region, but probably the number will be further increased when other parts of Madagascar have been more thoroughly explored. *Lonchotus crassus*, Klug, was found at Antongil Bay (Brit. Mus.), and Dr. Sicard has a series of *L. punctatissimus*, Arrow, from Mt. Amber. Of *L. politus*, Arrow, described from specimens collected by Professor Scott Elliot at Fort Dauphin in the south, Dr. Sicard has a female taken at Fianarantsoa.

The figures of male and female given in Grandidier's 'Histoire de Madagascar,' Coleoptera, pl. xx. figs. 5 & 6, with the name *Lonchotus crassus*, do not represent that species, but apparently *L. lentus*, Burm.

1 (16). Hind angles of the pronotum not rounded off.
2 (7). Propygidium coarsely striated.
3 (6). Sides of the pronotum very strongly punctured.
4 (5). Sides of the pronotum with a smooth space in the middle.
(Prothorax of male without anterior tubercles) ..... *crassus*, Klug.

5 (4).	Sides of the pronotum without a smooth space in the middle.....	[Arrow. *punctatissimus,*
6 (3).	Sides of the pronotum very feebly punctured	*lentus,* Burm.
7 (2).	Propygidium finely and closely striated.	
8 (9).	Elytra scantily punctured, with the sutural striæ obsolescent on the anterior half	*politus,* Arrow.
9 (8).	Elytra with deep entire sutural striæ and numerous confused punctures.	
10 (15).	Mandibles deeply notched and trilobed externally.	
11 (14).	Clypeus subelliptical, not dentate in front.	
12 (13).	Pronotum with a well-marked impunctate area before the scutellum	*sicardi,* sp. n.
13 (12).	Pronotum without a well-marked impunctate area before the scutellum ..	*borealis,* sp. n.
14 (11).	Clypeus triangular, with the apex minutely bidentate	*latus,* sp. n.
15 (10).	Mandibles subquadrate, not distinctly notched externally	*rotundus,* sp. n.
16 (1).	Hind angles of the pronotum rounded off.	*astovensis,* sp. n.

Lonchotus borealis, sp. n.

Niger, nitidus, corpore subtus rufo, breviter rufo-hirto, ovatus, rotundus; capite crebre granuloso, clypeo subelliptico, apice paulo arcuato, haud dentato; pronoto rugose punctato, area laterali lævigata, lateribus medio subangulatis, angulis posticis obtusis, basi vix sinuato; scutello fere impunctato; elytris fortiter confuse punctatis, punctis annulatis, lateribus lævigatis, apicibus obsolete punctatis, stria profunda integra suturali; propygidio paulo producto, striis stridulatoriis subtilissimis dense et late prædito; pygidio medio nitido, lateribus minute punctato-rugosis; mandibulis extus profunde incisis, trilobatis:

♂, capite sat breviter acute cornuto; pronoto modice late, profunde excavato, lateribus utrinque biacuminatis.

Long. 20-22·5 mm.; lat. max. 12–13 mm.

Hab. N. Madagascar: Grande Terre.

A series of specimens was taken by Dr. A. Sicard, who has kindly presented examples of each sex to the British Museum. In the best-developed male the thoracic excavation, which is not very wide, extends to within a short distance of the hind margin, but in others it only reaches about the middle. The surface of the cavity, as in all the species, is transversely wrinkled, and the rest of the pronotum is coarsely punctured, with the exception of a smooth area at each lateral edge. The middle of the hinder part is visibly, but not strongly, punctured. The elytra are moderately coarsely and rather confusedly punctured, the punctures being absent from the hinder part

except near the margin and the inner and outer edges. The propygidium bears very close and evenly distributed stridulatory striæ.

Lonchotus sicardi, sp. n.

Niger, haud nitidus, corpore subtus rufo, breviter rufo-hirto, ovatus, convexus; capite laxe rugoso, clypeo brevi, elliptico, vix dentato; pronoto inæqualiter grosse punctato, baseos laterumque medio lævigato, lateribus medio arcuatis, angulis posticis obtusis, basi leviter trisinuato; scutello impunctato; elytris parum fortiter confuse punctatis, punctis annulatis, lateribus lævigatis, apicibus obsolete punctatis, stria profunda integra suturali; propygidio paulo producto, striis stridulatoriis subtilissimis dense et lato prædito; pygidio medio fere polito, lateribus minute punctato-rugosis; mandibulis extus profunde incisis, trilobatis:

♂, capite sat breviter acute cornuto; pronoto modice late et profunde excavato, lateribus utrinque biacuminatis.

Long. 27 mm.; lat. max. 15–16 mm.

Hab. N. Madagascar: Antongil Bay, Vohémar.

A female specimen in the British Museum was taken at Antongil Bay, and Dr. Sicard has found both sexes at Vohémar. The female specimens from both localities are completely opaque above, but the single male, although less glossy than the other species of the genus, is not opaque. Whether the difference is accidental or characteristic we must await further observation to determine. The clypeus is rather short, very little attenuated in front, feebly impressed, but not toothed at its apex. The pronotum is almost devoid of punctures at the lateral margins, except the front angles, and at the middle of the base. The punctures of the elytra are not very large and not arranged in distinct rows.

Lonchotus latus, sp. n.

Breviter ovalis, niger, nitidus, corpore subtus fusco-rufo, sat dense rufo-hirto; capite rugoso, antice attenuato, minute bilobato; pronoto inæqualiter punctato, laterum baseosque medio fere lævigato, margine externo medio fere angulato, angulis posticis bene marcatis, fere rectis, basi leviter trisinuato; scutello fere lævi; elytris grosse et crebre irregulariter annulato-punctatis, lateribus lævigatis, apicibus obsolete punctatis, stria suturali integra profunde incisa; propygidio postice producto, striis stridulatoriis, utrinque subtilioribus læte et dense prædito; pygidio nitido, lateribus subtiliter rugulosis; mandibulis apice profunde fissis, extus trilobatis:

♂, capite breviter acute cornuto; prothorace late et profunde excavato, lateribus utrinque biacuminatis.

Long. 32 mm.; lat. max. 19 mm.

Hab. N. Madagascar.

The species is represented by a single male specimen in the British Museum collection. It is about the size of *L. crassus*, but relatively broader and shorter. The prothorax is irregularly punctured and has smooth areas at the middle of the base and sides. The hind angles are almost right angles. The thoracic cavity is about as broad as it is long, reaching to near the base, and, as in all the species except *L. crassus*, is produced into two points on each side. The elytra are closely and very coarsely punctured, the punctures not forming distinct lines. The propygidium is produced and its stridulatory striæ are fine and close, with a still more finely sculptured area on each side.

Lonchotus rotundus, sp. n.

Niger vel piceus, nitidus, corpore subtus rufo, breviter rufo-hirto, ovatus, rotundus, subglobosus; capite subrugoso, antice attenuato, haud inciso; pronoto omnino rugose punctato, absque areis lævigatis, lateribus medio subangulatis, angulis posticis obtusis, basi leviter trisinuato; scutello paulo punctulato; elytris grosse haud profunde punctatis, punctis annulatis, parum regularibus, lateribus lævigatis, apicibus obsolete punctatis, stria integra profunda suturali; propygidio postice producto, striis stridulatoriis subtilissimis dense et late prædito; pygidio medio nitido, lateribus minute punctato-rugosis; mandibulis extus subquadratis, vix incisis:

♂, capite sat breviter acute cornuto; pronoto late et profunde excavato, lateribus utrinque biacuminatis.

Long. 25-28 mm.; lat. max. 14–16 mm.

Hab. N. Madagascar: Nossi Bé.

There are two male specimens in the British Museum. It is a compact globose species, differing from all the rest by the form of the mandibles, which are very prominent externally and not distinctly lobed. The pronotum is very strongly and deeply punctured, without smooth spaces. The scutellum is not quite smooth, but bears an angulate line of rather confused fine punctures. The elytra are coarsely and irregularly but not very deeply punctured, and the propygidium bears very fine stridulatory striæ which extend without interruption across the whole median part. The thoracic cavity of the male extends nearly to the hind margin and is wide and deep.

Lonchotus astovensis, sp. n.

Fusco-brunneus, nitidus, pectore sat dense rufo-hirto, breviter

cylindricus, postice leviter ampliatus; capite toto rugoso, parabolico, antice vix inciso; pronoto fortiter sat inæqualiter punctato, postice medio lævigato, lateribus regulariter arcuatis, basi lævissime trisinuato, angulis posticis rotundatis; scutello lævi; elytris grosse haud profunde annulato-punctatis, punctis subseriatis, lateribus lævigatis, apicibus obsolete punctatis, stria suturali integra profunde impressa; propygidii medio striis striduloriis parum dense prædito; pygidii lateribus punctato-rugosis; mandibulis extus distincte trilobatus:

♂, capite breviter acute cornuto; pronoto profunde longitudinaliter excavato, lateribus utrinque biacuminatis; pygidio politissimo:

♀, paulo longiora, capite postice leviter angulatim carinato; pygidii medio subtiliter punctato.

Long. 20–22·5 mm.; lat. max. 11·5–12·5 mm.

Hab. Astove I.

A specimen of each sex was taken by Mr. P. R. Dupont and presented by him to the Museum. It is a rather small species of a dark reddish colour, and differs most markedly from its allies by the obsolete hind angles of the prothorax. The thoracic cavity of the male is rather narrow but deep, and extends almost to the hind margin of the pronotum. The punctures of the elytra are large, but not deep, and not distinctly arranged in rows.

VII.—*Two new Genera of Starfishes.*

By Walter K. Fisher, Stanford University, California.

The new genera belong to the Benthopectinidæ, their position being somewhere between *Benthopecten* and *Luidiaster* (*Acantharchaster*). The type species were described by me as *Acantharchaster* *, because the abactinal spinopaxillæ, marginal plates, and adambulacral armature show a great similarity to those of *Acantharchaster dawsoni*.

In his recent account of the Notomyta †, Ludwig recognizes eight genera, divided among two families, the Cheirasteridæ (corresponding to Verrill's Pontasterinæ) and the Benthopectinidæ. These two groups are equivalent to the Benthopectinidæ as employed by me in 1906 ‡. The new genera

* Zoologischer Anzeiger, Bd. xxxv., March 29, 1910, pp. 549–551.

† "Notomyota, eine neue Ordnung der Seesterne," Sitzungsb. k. preuss. Akad. d. Wiss. 1910, pp. 435–466.

‡ U.S. Fish Comm. Bulletin for 1903, pt. iii. p. 1039.

are intermediate in many respects between Ludwig's two families. They resemble *Luidiaster* (Cheirasteridæ) in the structure of the abactinal spinopaxillæ, heavily armed marginals, and adambulacral plates, but possess also the diagnostic feature of the other family—the odd interradial marginal plates. For this reason I am inclined to maintain the family Benthopectinidæ in the extended sense, and without subfamilies.

Ludwig recognizes two genera with odd interradial marginal plates: *Pararchaster*, having the abactinal plates with several spinelets, and *Benthopecten*, with only one spine or spinelet to a plate, rarely two or three. No other characters are designated. The two groups are extremely close, and often difficulty is encountered in deciding to which genus a given form belongs. This is true of the variable *B. acanthonotus*, Fisher, which is *Benthopecten* on the rays, and *Pararchaster* over most of the disk. My *B. claviger* would fall in *Pararchaster* and *B. mutabilis* probably in *Benthopecten*, although many plates have several spinelets (1 to 7). Unfortunately the type of *Pararchaster* is not so well differentiated from *Benthopecten* as some other species of the group—e. g., *P. spinosissimus*. I have used the name *Benthopecten* in the subjoined synopsis in the extended sense, equivalent to Sladen's (not Ludwig's) *Pararchester*. This key is intended to complement the second portion of Ludwig's synopsis ("Notomyota," p. 442).

An unpaired (odd) marginal plate present in some or all of the interradii. Dorsal muscle-bands not attached by a tendon to a proximal ambulacral ossicle.

a. Abactinal plates of papular areas low, tabulate, and strongly stellate, the larger bearing a conspicuous central spine surrounded by a circle of more or less elongate spinelets (fig. 5, p. 92); superomarginals with 2 or 3, inferomarginals with 2 to 5 long bristling spines (fig. 3); odd interradial marginal not especially prominent; usually absent in some of the interradii, never in all, and sometimes present in only one.

b. Papulæ extending one-third to three-fifths length of ray; mouth-plates with numerous (9 to 16) marginal spines disposed in three independent series on each pair of mouth-plates; the median teeth the longest, and less numerous than either furrow series (fig. 1); dorsal muscle-bands not very strong or prominent, often weak ..... *Nearchaster*, gen. nov.

bb. Papulæ extending only one-seventh length of ray; mouth-plates with comparatively few (5 or 6) marginal spines, regularly graduated in length toward inner teeth (fig. 2); dorsal muscle-bands stout and conspicuous ..... *Myonotus*, gen. nov.

aa. Abactinal plates flat or convex, not tabulate, and though frequently lobed on papulars areas, not strongly so, bearing a central spine only, or several spinelets in addition, or one to several small spinelets; superomarginals usually with only one large spine, and inferomarginals with one or two primary spines; odd interradial marginal prominent and usually present in all interradii ..... *Benthopecten*, Verrill.

NEARCHASTER, gen. nov.

Benthopectinidæ with the odd interradial marginal plate lacking in from one to four interradii, though sometimes present in all; not always present in both series of the same interradius; abactinal plates large and small intermingled, the larger primary plates bearing on a low tabulum a long sharp spine surrounded by a circle of accessory slender spinules, variable as to number and length—sometimes over half as long as the primary spine; secondary plates with a group of shorter spinelets; primary plates of papular areas strongly stellate; papulæ not in circumscribed areas, but distributed all over disk (except sometimes the very centre) and along ray from one-third to three-fifths its length, being confined to either side of the paxillar area distally; rays very long and slender; marginals extremely spiny—2 or 3 long sharp superomarginal spines and 2 to 5 inferomarginals; subambulacral spines 1 to 3, usually 2, long; furrow-spines 1 to 7; mouth-plates large, with numerous marginal spines, those of each pair of plates disposed in three independent series; the median teeth which are the largest and fewest, and on either side a series of 8 to 12 smaller spines, subequal or graduated in length toward the mesial members of the group; pedicellariæ when present large, pectinate, on any or all of the following plates: abactinals, inferomarginals, actinal intermediates; dorsal muscle-bands not attached to an ambulacral ossicle, rather weak.

Type, *Acantharchaster aciculosus*, Fisher, 1910.

MYONOTUS, gen. nov.

Benthopectinidæ similar to *Nearchaster*, but differing in having the papulæ confined to the disk and proximal seventh

of ray, in the comparatively few marginal mouth-spines, regularly graduated in length toward the inner teeth, and in the very stout dorsal muscle-bands; marginal plates very spiny (2 or 3 superomarginal and at least 3 inferomarginal spines); primary abactinal plates of papular areas strongly lobed and in the form of tabulate paxillæ, bearing a large central spine, and a circle of small spinelets on the tabulum; odd interradial marginals present in all interradii, the unpaired superomarginal not conspicuously larger than neighbouring plates, and its spines not larger than succeeding superomarginal spines; adambulacral furrow-spines 1 to 3, long; subambulacral spines 2.

Type, *Acantharchaster intermedius*, Fisher, 1910.

Fig. 1.

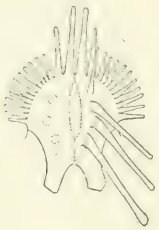

Fig. 3.

Fig. 4.

Fig. 2.

Fig. 5.

Fig. 1. Mouth-plates of *Nearchaster aciculosus*. × 3.
2. Mouth-plates of *Myonotus intermedius*. × 3.
3. Seventh superomarginal plate of *Nearchaster aciculosus*, from above. × 3.
4. Eighth adambulacral plate of *Myonotus intermedius*: *f*, furrow-spines. × 3.
5. Abactinal paxillæ of *Nearchaster aciculosus*. × 3.

VIII.—*Description of a new Species of* Temnophyllus, *Brunn.-Watt.* (*Orthoptera*: Phasgonuridæ), *from the Malay Peninsula.* By W. F. Kirby, F.L.S., F.E.S., late Assistant in Zoological Department, Natural History Museum, South Kensington.

[Plate III.]

Dr. F. Hanitsch has kindly presented to the Natural History Museum a very handsome Phasgonuride belonging to the family Pseudophyllidæ and the section Phyllomimi of Brunner. It was collected by Mr. V. Knight at Bukit Lantai, Sungi Ujong, Malay Peninsula, in July 1910; and at Dr. Hanitsch's request I have much pleasure in naming it after the collector.

Temnophyllus knighti, sp. n.

Allied to *T. speciosus*, Brunn.-Watt. Mon. Pseudophylliden, p. 46. n. 1, pl. ii. fig. 13 (1895), from Malacca and Borneo.

Head smooth, conical, white; antennæ twice as long as the tegmina, green towards the base, afterwards with long black spaces, and the latter half almost entirely black; scape whitish below, above green, with a slight tooth internally. Pronotum dull white, shading into green at the extremity, the transverse sulci only slightly marked, not so close together as in Brunner's figure of *T. speciosus*; the longitudinal sulcus very slightly marked and obsolete in front of the first transverse sulcus; the surface is marked with small, scattered, reddish-brown, raised granules, and the deflexed lobes are strongly serrated at the lower extremities. Tegmina leaf-green, of nearly uniform breadth, the extremity broadly emarginate. On the costa is a continuous narrow white line, and at the base the inner margin and mediastinal nervure are broadly reddish grey for a short distance. Beneath the mediastinal nervure are three large triangular white spots, each bisected by a nervure, and bordered, except at the base, with black. Just above the base of the mediastinal nervure is another small triangular white spot, and there is another small one, of irregular shape, and enclosing a reddish-brown mark, a little within the middle of the inner margin. Wings about as long as the tegmina and similarly emarginate, green as far as visible. Front legs green, inner carina with four moderate-sized spines; white beneath, with a broad black

stripe along the middle carina. Front tibiæ with both the lower carinæ spinose, and a spine on the upper carina beyond the middle. Middle and hind femora strongly spined on the outer carinæ; the tibiæ with the upper and the two lower carinæ all spinose. Under surface of body white; ovipositor with the valves broad, and black towards the extremities, which are obtusely pointed.

Length from tip of head to end of tegmina 85 mm.; breadth of tegmina 22 mm.; length of antennæ 125 mm.

IX.—*Some new* Curculioninæ *from Central and South America*. By G. C. Champion, F.Z.S.

Since the publication of the Appendix to the Curculioninæ in the 'Biologia Centrali-Americana' [Coleopt. iv. pt. 7, pp. 178–212 (Oct. 1910)] a few additional forms have been found amongst the stores at the British Museum, and as there are two fine new Zygopids amongst these insects, it is advisable to describe them at once, before the collection of this subfamily is presented to the Museum by Dr. F. D. Godman. The Zygopids are particularly interesting, as they prove to be common to Costa Rica and Ecuador.

Hylobiina.

Hilipus carinicollis, sp. n.

♀. Rather short, broad, piceous, the depressions of the surface somewhat sparsely clothed with very small, hair-like, ochreous scales, the prothorax with a transverse patch of broader, similarly-coloured scales on each side in front, a larger patch on the anterior part of the flanks beneath, and a few white scales at the base near the hind angles, the elytra also with several small widely scattered intermixed patches of rather broad white scales, these being clustered into an irregular transverse fascia at one-third from the apex, the scutellum albo-squamose. Head densely punctate, foveate between the somewhat narrowly separated eyes; rostrum very feebly curved, moderately stout, a little longer than the head and rostrum, sparsely punctate, smooth along the median line to near the tip. Prothorax strongly transverse, slightly rounded at the sides, and abruptly constricted and narrowed in front; sharply carinate and coarsely granulate. Elytra moderately long, broad, punctate-striate, the

dorsal interstices raised and each with a series of small, smooth, shining tubercles extending down their entire length.

Length 9½, breadth 4⅓ millim.

Hab. W. Coast of America, ? Panama (*Kellett and Wood*).

This insect was received by the British Museum in 1850, but not incorporated in their general collection. It was doubtless obtained at Panama, the type of *Metamasius dimidiatipennis* (Jekel), a species known to occur there, bearing a similar locality-label. *H. carinicollis* may be readily identified by its extremely short, sharply carinate, granulate prothorax, and the coarsely seriato-granulate, irregularly albo-fasciate elytra. It approaches the Mexican *H. crux-alba*.

Anchonina.

Anchonus sphæricus, sp. n.

Oblong, convex, opaque, black, the antennæ piceous or obscure ferruginous, the surface more or less coated with a dark brown exudation, amidst which patches of very minute adpressed scales are visible; the legs sparsely setulose. Rostrum curved, stout, about as long as the head and prothorax, not constricted at the base, coarsely and closely seriato-punctate to the tip. Eyes small, depressed, transverse. Antennæ inserted near the apex of the rostrum, the eighth joint of the funiculus large, a little broader than long, nearly as wide as the base of the club. Prothorax slightly broader than long, rounded at the sides, narrowed and feebly constricted in front; rather sparsely punctate, the punctures small and each placed in a shallow, rather large fovea, the interspaces with a few minute, shining, widely scattered, transverse or rounded granules. Elytra oval, convex, at the middle much wider than the prothorax; with rows of scattered punctures, which are each placed in a large shallow fovea, the interstices with numerous, more or less distinct, rounded, feeble, tuberculiform prominences and a few minute shining granules similar to those on the prothorax, 3, 5, and 7 angularly raised or tuberculiform at the base. Ventral segments 1 and 2 on the same level, the suture between them sinuous and shallow.

Length 9–10, breadth 4⅓ millim.

Hab. Nicaragua, Chontales (*coll. Fry*); Colombia (*Mus. Brit.*).

Two examples, the one from Colombia (taken as the type)

with the elytra more distinctly tuberculate, and the prothorax more uneven, than the insect in the Fry collection, the Nicaraguan locality for which seems to require confirmation. The prominences on the elytra are equal in size and less conspicuous than in the nearest allied Central-American forms, from most of which the present species also differs in its large size and in the trinodose basal margin of the elytra. The Colombian specimen is labelled with the MS. name *A. sphæricus*, Buq., in the British Museum.

Anchonus rufipes, sp. n.

Oblong, convex, opaque, black, the antennæ and legs ferruginous, the surface more or less coated with a brownish exudation and also set with very minute, short, scattered setæ. Rostrum stout, feebly curved, about as long as the prothorax, rugosely punctate to the tip, not constricted at the base. Eyes depressed, transverse. Antennæ inserted near the apex of the rostrum, the eighth joint of the funiculus transverse. Prothorax broader than long, rounded at the sides, abruptly constricted in front; densely foveolato-punctate, the narrow interspaces here and there obliquely raised or granulate. Elytra oval, at the base a little wider than the base of the prothorax, moderately produced at the apex; with rows of closely placed rather fine punctures, the interstices subcostate, the ridges broken up into small tubercles on the apical half, and with a few widely scattered, minute, shining granules. Beneath coarsely punctate; ventral segments 1 and 2 connate in their median third.

Length $5\frac{1}{2}$, breadth $2\frac{1}{2}$ millim.

Hab. Mexico (*Dupont*).

One specimen, contained in the Bowring collection, purchased in 1863, and incorrectly labelled *A. elongatus*, Sch., in the British Museum. This species is abundantly distinct from any of the *Anchoni* described or enumerated in the 'Biologia.' The ridges on the elytra, except towards the apex, are less interrupted than in most of the Mexican forms, the insect in this respect approaching *A. panamensis*; the tubercles, too, on the apical declivity are small. Compared with *A. elongatus* (the type of which I have seen), the present species is less elongate and has a shorter prothorax, with the sides strongly rounded, and the seriate punctures on the elytra are small and closely placed.

ZYGOPINA.

Cratosomus sextuberculatus, sp. n.

Elongate-rhomboidal, broad, black, the elytra and under surface with a faint æneous, green, or bluish lustre; the prothorax with a large, transverse, anteriorly rounded patch on each side at the base, and the elytra with the base and a transverse postmedian fascia (becoming narrower inwards and not reaching the suture), finely fulvo- or cinereo-pubescent. Head closely, minutely punctate; eyes very large, narrowly separated in ♂, a little more distant in ♀; rostrum curved, very stout, moderately long, finely punctured, smooth at the tip. Prothorax transverse, rather convex, rounded at the sides, much narrowed in front, opaque, closely, minutely punctate, and with an abbreviated median carina. Elytra broad, triangular; coarsely foveato-striate, the foveæ decreasing in size towards the apex; the interstices convex to about the middle, 3 with a very large rounded tubercle a little below, and 7 and 9 each with a slightly smaller tubercle at the base, that on 9 projecting laterally; the apices each armed with a long, stout, oblique, spiniform tooth. Pygidium broadly exposed beneath in ♂, narrowly so in ♀. Femora sharply unidentate.

♂. The median portion of the metasternum and of the first two ventral segments densely clothed laterally with long, erect, reddish-brown hairs, the lower surface of the intermediate and posterior femora also densely clothed with similarly coloured hairs.

Length 25–28, breadth 12½–13 millim. (♂ ♀.)

Hab. COSTA RICA, Tucurrique, 800 metres (*Pittier*: ♀); ECUADOR, Cachabé (*Rosenberg*: ♂).

Two males, found in Nov. 1896, in the "tierra caliente" of Ecuador, and one female, received from Mr. Pittier, in 1897, from Costa Rica. Very similar to *C. hoplites*, Perty (=*lacrimans*, Gyll.), but with the elytra tri-tuberculate at the base and conspicuously fasciate beyond the middle, the metasternum and first two ventral segments clothed with long reddish-brown hairs down their median third in the male, the intermediate and posterior femora also pilose beneath in this sex. *C. subtuberculatus* should follow *C. spicatus* in the arrangement of the Central-American forms.

Cratosomus biannulatus, sp. n.

Subcuneiform, rather narrow, black; the prothorax and elytra with a very large, common, oval annulus (extending

from the middle of the former to the middle of the latter), the elytra with a common, rounded, smaller annulus on the apical declivity, the prothorax with an oblique stripe on each side anteriorly (as seen from above) and the whole of the flanks (a large spot in the middle excepted), the head around the eyes, and the base of the rostrum, thickly clothed with minute, fulvous or brownish-cinereous, hair-like scales, the under surface and legs sparsely set with slightly longer similarly-coloured scales. Head densely punctate; eyes very large, well separated in both sexes; rostrum very stout, curved, moderately long, finely punctured, smooth at the tip. Prothorax a little broader than long, gradually narrowing from the base, opaque, closely, minutely punctate, and sometimes obsoletely carinate towards the apex. Scutellum oblong, sulcate. Elytra cuneiform, foveato-striate, the foveæ decreasing in size towards the apex; the interstices convex, 1–4 for about two-thirds of their length set with scattered, small, smooth tubercles and then becoming flat on the apical declivity; the annulate portions of the surface depressed, the humeri rounded. Femora sharply unidentate. Pygidium broadly exposed beneath in ♂, very narrowly so in ♀.

Length 19–20, breadth $8\frac{1}{2}$–$8\frac{2}{3}$ millim. (♂ ♀.)

Hab. Costa Rica (*Mus. Dresden*); Ecuador, San Javier and Lita (*coll. Fry, in Mus. Brit.*).

Described from four specimens from Ecuador. Dr. Heller, of the Dresden Museum, has also sent me an example of the same species, labelled as from Costa Rica, for determination, the habitat of which seemed to me to be doubtful at the time, and the insect was therefore omitted from the enumeration of the Central-American *Cratosomini*. There is, however, no reason to think that a mistake had been made in labelling, *C. sextuberculatus* having a similar geographical distribution. *C. biannulatus* should follow *C. aspersus* in the arrangement of the Central-American forms.

X.—*New Species of Diploptera in the Collection of the British Museum.* By Geoffrey Meade-Waldo, B.A.

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Part III.

In the present paper are contained descriptions of some new species of the family Vespidæ from various localities.

The occurrence of two species of *Parapolybia* in the

collection of Hymenoptera made by Escalera in S.W. Persia is of much interest, since it adds considerably to our knowledge of the distribution of the genus.

The measurements of length, as on previous occasions, have been taken from the front of the head to the apical margin of the second abdominal segment, unless special mention is made to the contrary. All the types are in the National Collection.

Eumenidæ, Westwood.

Pterochilus, Klug.

Pterochilus korbi, Schulz.

Pterochilus korbi, Schulz, Hymenopteren-Studien, pp. 48–52 (1905).
Pterochilus aterrimus, E. Saunders, Trans. Ent. Soc. Lond. p. 403 (1905).

A comparison between the types of these two species proves them to be identical. The locality of capture for both is Biskra. *B. korbi* has priority of publication by a few months, although the descriptions of both were published in the same year.

Vespidæ, Latr.

Belonogaster buyssoni, sp. n.

B. pusillo similis, sed facie omnino ferrugineo, tarsisque nigris.

♀. Ferruginous; antennæ, mesonotum, and segments 2–6 of the abdomen blackish; tergites of segments 2, 3, 4 of abdomen with two whitish-yellow oval marks on the latero-apical margin, the marks on segment 2 being larger than those on segment 3, and the latter larger than those on segment 4. Femora obscure, tibiæ and tarsi black. Head and clypeus normal, the latter sharply pointed. Antennæ short and slender. Wings hyaline, somewhat cloudy towards the apex, and golden-yellow along the costa. Stigma golden-yellow. Abdomen with the petiole long and slender, longer than the thorax; abdominal segment 2 with a long petiole and widening gradually towards the posterior end. Pubescence on thorax short, thick, whitish yellow.

Total length 20 mm.

2 ♀.

Hab. Iganga Busoga, S. Nigeria (*J. J. Simpson*). Collected for the Entomological Research Committee (Tropical Africa), 29. iii. 1909.

This insect, which I have much pleasure in dedicating to M. R. du Buysson, of the Paris Museum, is very similar to *B. pusillus*, Kohl, in general appearance, but may be readily distinguished by the absence of yellow markings on the face and clypeus and the totally black tarsi.

Mischocyttarus, Sauss.

Mischocyttarus labiatus.

Zethus labiatus, F. Syst. Piez. 1804, p. 284. no. 6.
Polybia melanaria, Cam. Invert. Pacif. i.

Cameron's species, described from Belize, British Honduras, is a typical example of *M. labiatus*, F.

Icaria, Sauss.

Icaria flavopicta, Smith.

Icaria flavopicta, Smith, Cat. Hym. Brit. Mus. vol. v. p. 99 (1857) (Borneo).
Icaria ornaticeps, Cam. Ann. & Mag. Nat. Hist. (7) vol. vi. p. 497 (Khasia Hills).

The yellow marks on the head and mesonotum, by which Cameron says that *I. ornaticeps* is easily known, are present in *I. flavopicta*. The type specimen from Borneo varies in no respect from specimens from the Khasia Hills, Burma, Tenasserim, and Sikkim in the National Collection.

Icaria conservator, Smith.

Icaria conservator, Smith, Journ. Proc. Linn. Soc., Zool. iv. Suppl. p. 130. no. 1 (1860).
Polybia limatula, Smith, Journ. Proc. Linn. Soc., Zool. vii. p. 43. no. 1 (1863).

I. conservator, described from Dory, New Guinea, is certainly the same species as that described three years later as *P. limatula* from Mysol, the type of which, preserved in the Oxford University Museum, has been compared with specimens of the former from Smith's own collection, now in the British Museum.

Icaria festina, Smith.

Icaria festina, Smith, Journ. Linn. Soc., Zool. viii. p. 90. no. 6 (1864).
Icaria zonata, Cam. Nov. Guinea, v. livr. i. p. 61.

Both specimens described are from New Guinea.

Polistes, Latr.

Polistes tristis, sp. n.

Niger, fusco-ferrugineo variegatus, abdomine nigro; alis leviter infuscatis, cellula radiali fusca.

♀. Black; scape entirely and flagellum partially beneath fusco-ferruginous; mandibles, clypeus, cheeks, space behind the eyes, pronotum, scutellum, postscutellum, two longitudinal lines on median segment, the legs (with the exception of the coxæ and femora above) fusco-ferruginous. Two small marks at extreme apex of median segment and on apex of first abdominal tergite laterally pale yellow. Wings fusco-hyaline, distinctly golden along the costal area, radial cell fuscous. Clypeus pentagonal, gradually widening from base, widest part at base of mandibles, produced to a point at apex. Abdomen normal. Clypeus and thorax finely punctured, median segment coarsely transversely striate. The whole insect covered with a short thick silver pubescence.

Length 14 mm.

3 ♀.

Hab. Mombasa, E. Africa (*A. J. Cholmeley*).

Quite distinct from any known species in the almost totally black abdomen. Possibly the two yellow marks on the first abdominal tergite may be the remains of a yellow fascia; in one specimen there is no trace whatever of the yellow marks.

Polistes variabilis reginæ, var. nov.

Ferrugineus, flavo variegatus; pedibus unicoloribus.

♀. Pale ferruginous; pronotum along the front and hind margin, narrow transverse lines on the base of scutellum and postscutellum, a small ovoid spot on mesopleuræ, and two broad longitudinal marks on the posterior face of the median segment pale testaceous. First abdominal segment (except for small ferruginous mark on tergite) pale yellow; abdominal segment 2 with narrow transverse apical band, abdominal segments 3, 4, 5 with broad transverse apical bands pale yellow. Legs entirely pale ferruginous. The whole insect densely covered with a short golden pubescence. Wings fusco-hyaline, slightly golden along the costa.

Length 11 mm.

7 ♀.

Hab. Cooktown, N. Queensland (*D. Le Souef*).

A well-marked variety of *P. variabilis*, F., all the black markings of which are wanting. The pale testaceous markings are evidently the yellow markings of typical *variabilis* much reduced in intensity. The clypeus is ferruginous, not yellow as in *P. variabilis*.

Polistes phillipinensis, Sauss.

Polistes phillipinensis, Sauss. Ét. Fam. Vesp. vol. ii. p. 58.
Polistes nigrifrons, Cam. Ann. & Mag. Nat. Hist. (7) vol. vi. p. 412.

Cameron's species is from the Khasia Hills, according to his description. "Himalaya" is the MS. locality on the label. Dalla Torre gives "Japan" in Gen. Insect., Fam. Vespidæ, p. 71. *P. rugifrons* is a colour-variety of *P. phillipinensis*, probably the variety mentioned by Saussure as "Tout l'insecte plus ou moins rougeâtre." Two specimens, collected by Whitehead on Cape Engano, Luzon, and determined by the late Col. Bingham (Ann. & Mag. Nat. Hist. (6) vol. xvi. p. 444), belong to this variety. The median segment of Cameron's type is too mutilated for examination, but, as far as can be seen, the transverse striation is very deep.

Polistes tepidus, Fabr.

Polistes tepidus, Fabr. Syst. Entom. p. 366. no. 17 (1775).
Polistes malayanus, Cam. Nova Guinea, v. livr. i. p. 60 (1906).

A comparison with the type in the Banksian Collection makes it evident that *P. malayanus* from Manokwari, New Guinea, is typical *P. tepidus*.

Polistes flavobilineata.

Icaria flavobilineata, Cam. Journ. Straits Asiat. Soc. vol. xxxvii. p. 102 (1902).

Cameron's species, described from Borneo, is without doubt a *Polistes*. The first abdominal segment is of the normal shape for that genus. It comes very near to *P. manillensis*, Sauss., from the Philippines and Borneo. Both species have the median segment only indistinctly transversely striate on the posterior slope.

Polistes elegans, Smith.

Polistes elegans, Smith, Journ. Proc. Linn. Soc., Zool. iii. 1858, p. 169 (♀).
Polistes simulatus, Smith, Journ. Proc. Linn. Soc., Zool. iv. 1860, Suppl. p. 130.

P. elegans, described from Aru and Key Islands, is undoubtedly the same as *P. simulatus* from Batchian and Morty Island. Smith notes after his description of the latter that it may be an extreme variety.

Polistes actæon.

Polistes actæon, Hal. Trans. Linn. Soc. Lond. xvii. (3) p. 323 (1836).
Polistes limai, Ihering, Ann. Soc. Ent. Fr. vol. lxxii. p. 145 (1903).

A comparison between this species and the type of *P. actæon* proves them to be identical. Dalla Torre ('Catalogus Hymenopterum,' vol. ix. Vespidæ, p. 122) gives a reference to Latreille ('Encyclopédie Méthodique,' vol. x. p. 171, 1825) where no reference is made to *P. actæon*, and rightly cites Haliday as the author, though Latreille would have priority. In 'Genera Insectorum,' Fam. Vespidæ, p. 68 (1904), Latreille is cited as the author of *P. actæon*, evidently an attempt to correct the synonymy in the 'Catalogus.'

Polistes humilis, F.

Polistes humilis, F. Spec. Insect. i. p. 461. no. 20 (1781).
Polistes tasmaniensis, Sauss. Étud. Fam. Vespid. p. 66 (1853).

Specimens of *P. tasmaniensis* in the National Collection are certainly identical with *P. humilis*, F., the type of which is in the Banksian Collection (Fabricius, Spec. Insect. i. p. 461. no. 20, 1781), and not in Paris as stated by Saussure. I have not seen the type of *P. tasmaniensis*, which is in Paris.

Key to the Australian Species of Polistes.

A. Large species, 18–24 mm.
- *a*. Colour totally ferruginous: length 18 mm. — *schach*, F.
- *b*. Colour yellow and black or ferruginous and black.
  - a^2. Mesothorax black, with two parallel yellow marks on disc.
    - a^3. Scutellum, postscutellum, median segment, and first abdominal segment black: length 18 mm. ..... — *tepidus*, F.
    - b^3. Scutellum, postscutellum, two lines on median segment, and first abdominal segment at apex yellow: length 21 mm. ..... — *picteti*, Sauss.
  - b^2. Mesothorax ferruginous; median segment black: length 24 mm. ..... — *erythrinus*, Holmgr.

B. Small species, 11–15 mm.
  a. Antennæ entirely ferruginous.
    a^2. Median segment black.
      a^3. Abdominal segments 1–3 bordered with yellow; no red markings on abdominal segment 2: length 13 mm. — *tricolor*, Sauss.
      b^3. Abdomen entirely ferruginous; abdominal segment 1 with a narrow apical yellow fascia: length 12 mm. — *humilis*, F. (*tasmani-* [*ensis*, Sauss.).
    b^2. Median segment with two parallel yellow lines on posterior surface.
      a^2. Abdominal segments 1, 3 with transverse yellow apical bands.
        a^3. Abdominal segments 1, 2 black at base: length 12 mm. — *variabilis*, var. *synœcus*, [Sauss.
        b^3. Abdominal segments 1, 2 reddish brown: length 14 mm. — *bernardii*, Le Guill.
      b^2. Abdominal segments 1–5 with transverse yellow apical bands; yellow thoracic markings indistinct: length 11 mm. — *variabilis*, var. *reginæ*, [M.-Waldo.
  b. Antennæ black above, ferruginous beneath. Median segment with two parallel yellow lines on posterior surface; abdominal segments 1, 3, 4 bordered with yellow: length 11½ mm. — *variabilis*, F.

The length given is from the front of the head to the apex of the second abdominal segment. In two species (*P. erythrinus* and *P. bernardii*), of which specimens have not been available for examination, the length as given in the description has been quoted. In the case of *P. erythrinus* the total length (24 mm.) has evidently been given, and this is probably the case with *P. synœcus*.

No specimen of *P. picteti* from Australia was available, the whole series in the National Collection coming from Ceram, Amboyna, and Celebes.

Vespa, Linn.

Vespa wilemani, sp. n.

Caput thoraxque fusco-ferruginei, valde hirsuti; abdomen nigrum, flavo variegatum, pedibus flavis, alis aureis.

♀. Head and thorax dark ferruginous; mandibles, clypeus, and interantennal space yellow. Abdomen black; abdominal segment 1 marked with ferruginous at base, and with a narrow apical yellow fascia; abdominal segments 2 and 3 with narrow yellow fasciæ on tergites and broad yellow fasciæ on sternites; abdominal segment 4 broadly banded

with yellow on apical margin of both tergite and sternite. Legs entirely dark orange-yellow. Wings golden hyaline, darkest along the costa.

Head as broad as thorax, moderately dilated behind the eyes, the transverse furrow on pronotum very distinct. Clypeus finely punctured, the anterior angles bluntly rounded. Thorax broad and short, abdomen broadly truncate at base. Whole insect covered with a long, dense, black pubescence.

Length 17 mm.

1 ♀.

Hab. Formosa (*A. E. Wileman*).

M. R. du Buysson, who has seen the insect, considers it to be very closely allied to *V. variabilis*, du Buyss., of which species the coloration is very variable.

Vespa mandarinia, Smith.

Vespa mandarinia, Smith, Trans. Entom. Soc. Lond. ii. p. 38, t. viii. fig. 1 (1852) (Japan).

Vespa magnifica, var. *latilineata*, Cam., MS.

Synœca, Sauss.

There appears to be some difference of opinion as to the position of the opening in the nests of these wasps.

Du Buysson, in his admirable "Monographie des Vespides appartenant aux genres *Apoica* et *Synœca*" (Soc. Ent. France, vol. lxxv. (1906) p. 348), says that Saussure and Möbius have both represented the nest as having the opening at the lower end, but that it is in reality at the top. The nests figured were in each case those of *Synœca surinama*, L. The Rev. G. C. Hungerford Pollen, S.J., who has spent some years in British Guiana, has made some most interesting observations on the habits of this insect, and has been good enough to allow me to make use of them.

It will be noticed that all nests observed by Mr. Pollen had their solitary opening at the lower end.

Other interesting observations were made on the habits of a Chalcid fly (*Epitelia aculeata*, Walker), which was observed to oviposit in the nests, and on the manner in which the whole colony of *Synœca* would unite in saving their home from destruction by the tropical rain. Some of these observations are best quoted verbatim from Mr. Pollen's notes:—

"About Christmas 1908 I was on the N.W. coast at the mouth of the Essequibo River, British Guiana, about 35 miles from Georgetown. There is a long stretch of sand with

shrub and trees (the latter chiefly Courida), extending from Suddie Stelling to the mouth of the Pomeroon River. A path runs parallel to the coast, and at 20 to 50 feet from the highest tide-line. The *Synœca* appears to favour chiefly a spot where there is some clay-mud, supporting a fairly dense curtain of shrubs, so that they are protected both from the breeze, which blows straight from the sea practically all the year, and also from the sun. The nests, with the characteristic horizontal 'fluting,' are very numerous, but confined to a small locality. They are on a level with the eye, 4 to 5 feet from the ground, where the trunks or branches are about 3 to 4 inches diameter. All the nests seen by me were on the side of the stem furthest from the sea and protected from the wind, on a sloping part of the tree, so that the stem above them is a protection from direct rain. As will be noticed later, the wasp still has to deal with rain running down the stem. *The entrance is always at the lower end*" *.

Here follows a detailed account of the structure of the nest, into which it is unnecessary to enter; but Mr. Pollen proceeds to give an account of one individual colony which he kept under observation. The nest had become soaked from a heavy deluge of rain.

"The number of the colony appeared to be about twenty, as I presume all hands were called on deck to 'man the pumps.' Shortly after my arrival, during a heavy rainfall, a stream of water ran down the trunk of the tree and soaked into the tent-wall. Immediately there was an angry buzzing, and some twenty wasps climbed out of the nest and began sucking up the moisture with their mouths, moving their antennæ and mandibles rapidly. As each one in succession drank up as much moisture as it found convenient, it turned to the side of the tent, and took up a position so that it could look down, clear of the nest, towards the ground. Then, straightening its second and third pair of legs, it opened its mandibles as wide as possible, and raised its antennæ, which waved about slowly but irregularly, while the whole body trembled with the evident effort of bringing up all the water, which fell from the mouth in two or three big drops. From the size of these drops and the slowness with which they detached themselves from the mouth I surmise that the water had become rather viscous; but I was unable to approach near enough to catch any of the drops. Often when one or two drops had fallen the third was too long in

* The italics are mine.—G. M-W.

leveloping in the mouth. Then there was more trembling nd effort, and the front pair of legs were used to brush the lrop off the mandibles. There were also frequent visits paid o the interior, so that the entrance was in use almost the whole time, thus making it impossible to count accurately."

Then follows an account of the parasite and its method of oviposition.

"The whole time of my observation, about two hours, there were four or five *Epitelia aculeata* walking about on the outside of the tent. Every now and then one would get close to the base and pierce it with its ovipositor. I timed one for five or six egg-layings, and should give an average of two or three minutes' interval between the eggs. It was, however, very difficult to make sure that I was keeping my eye on the same one, as their movements were very quick, and often two or three would take a short flight of a foot or two from the nest at the same time. The parasites were evidently in fear of their hosts, constantly shifting their position, by sideward and even backward running, so as always to present their faces to the wasps. . . . The length of my observation was chiefly due to my wish to detect any host objecting to one of what he ought to regard as most unwelcome guests; but I could not see the slightest sign of notice on the part of the *Synœca*. The excitement of the *Epitelia* was apparently a case of 'the wicked fleeing when no man pursueth.'"

Polybia, Lepel.

Polybia rejecta, F.

Polybia rejecta, F. Suppl. Ent. Syst. p. 264 (1798) (Cayenne).
Polybia bicolor, Sm. Cat. Hym. Brit. Mus. vol. v. p. 131 (1857) (Brazil).
Polybia brunnea, Curt. Trans. Linn. Soc. Lond. vol. xix. pl. i. p. 256 (1844) (Brazil).
Polybia vicina, Sauss. Étud. fam. Vesp. vol. ii. p. 189, pl. xxiv. fig. 7 (1853) (Brazil).

P. brunnea, Curtis, described first as *Myrapetra brunnea*, was one of the species which Saussure had not seen when engaged on his 'Études sur les Vespides.'

Polybia sylveiræ, Sauss.

Polybia sylveiræ, Sauss. Ét. fam. Vesp. vol. ii. p. 171, pl. vi. fig. 2 (1853) (Brazil).
Polybia enxuy, Smith, Trans. Ent. Soc. Lond. (3) i. 6, p. 511 (1863).

Smith's species appears as *P. enxius* in Dalla Torre, 'Catalogus Hymenopterum,' vol. ix. Vespidæ, p. 163. The type of *P. enxiu* bears the label in his handwriting, the specific name being the vernacular term for the species in South America (*vide* Trans. Ent. Soc. Lond. (3) i. 6, p. 504).

Polybia bifasciata, Sauss.

Polybia bifasciata, Sauss. Étud. fam. Vesp. ii. p. 172. no. 7 (1853).
Polybia quadricincta, Sauss. Étud. fam. Vesp. ii. p. 173. no. 8 (1853).

A specimen of *P. bifasciata* determined by Ducke is certainly identical with *P. quadricincta*, Sm., with the type of which it has been compared. Ducke has doubtless seen the type of *P. bifasciata* in the Paris Museum.

Polybia (*Parapolybia*) *sumatrensis*, Sauss.

Polybia (*Parapolybia*) *sumatrensis*, Sauss. Rev. et Mag. Zool. (2) vii. p. 374 (1855).
Icaria sulciscutis, Cam. Proc. Zool. Soc. Lond. vol. ii. p. 30 (1901).
Icaria rubriscutis, Cam. MS.

Dr. Schulz, in 'Spolia Hymenopterologica,' places *Icaria sulciscutis*, Cam., described from Singapore, in the right genus.

There can be no doubt that *P. sumatrensis*, Sauss., the type of which is in the British Museum, and with which Cameron's species have been carefully compared, is the same species.

Polybia (*Parapolybia*) *orientalis*, Sauss.

Polybia (*Parapolybia*) *orientalis*, Sauss. Mon. Guêp. Soc. vol. ii. p. 208 (1853).
Icaria fuscipennis, Cam. Ann. & Mag. Nat. Hist. (7) vol. vi. p. 501 (1900).

I. fuscipennis, Cam., from the Khasia Hills, is certainly nothing more than a colour-variety of *P. orientalis*, from which species it differs (*a*) by the absence of the longitudinal yellow stripes on the mesonotum, (*b*) the yellow at the base of abdominal segments 3 and 4 forms a continuous band both dorsally and ventrally, and is not broken dorsally as in *P. orientalis*. The general ground-colour also is more chocolate-brown than in that species, and the antennæ darker.

Polybia (*Parapolybia*) *persica*, sp. n.

♀. Nigra, pallide flavo variegata; mesothorace unicolori, abdominis segmentis flavis apice fasciatis; petiolo gracillimo.

Black; the mandibles, the clypeus apically and laterally, three small ovoid spots on the front (the two lower situated between the base of the antennæ), the inner margin of the eyes (including the sinus), the space behind the eyes, the pronotum in front, and a narrow line along the posterior margin to the tegulæ, the tegulæ, a spot on the mesopleuræ, two small spots on the scutellum, and two lines on the posterior face of the median segment, pale yellow. Abdomen with the petiole along the basal lateral half, two minute marks at the base of the second segment, and the apical margin of all the segments pale yellow. Legs: the anterior pair with femora at the apex, the tibiæ and tarsi, intermediate pair with coxæ beneath, femora and tibiæ apically, and tarsi, posterior pair with femora and tibiæ at apex, and tarsi (except the first joint at the base), pale yellow. Antennæ pale ferruginous, the scape black dorsally. Wings hyaline, slightly fuscous in the radial cell.

Head as broad as thorax at the tegulæ, genæ very short.

Prothorax truncate anteriorly, widening towards the tegulæ. Petiole long and slender, about as long as head and thorax combined, rather broader along the apical half; second abdominal segment cup-shaped, gradually widening towards the apical margin.

Clypeus with a few minute punctures and sparsely fringed with white hairs; thorax and abdomen impunctate except for a fine transverse striation on the apex of the median segment. A short dense grey pubescence on the thorax.

Length 10 mm.

Hab. Kuh Sefid, S.W. Persia (*Escalera*); 4 ♀.

The slender build of this species separates it from any described Asiatic *Polybia*. The petiole is longer and more slender, and the widening of the second abdominal segment more gradual. Most nearly allied to *P. orientalis*, Sauss., and *P. sumatrensis*, Sauss.

Polybia (*Parapolybia*) *escalerœ*, sp. n.

♀. Precedenti similis, sed omnino pallidior; mesothorace duabus lineis pallide flavis, abdominis segmentis late flavo-fasciatis.

Black; the scape beneath, the mandibles, the clypeus (except for a faint median longitudinal line), a large ovoid mark between the antennæ, the inner margin and sinus of the eyes, the space behind the eyes, and two small marks on the vertex pale yellow. Thorax black; the pronotum in front and along the posterior margin to the tegulæ, the

tegulæ, two parallel lines on the disc of the mesonotum, the greater part of the mesopleuræ, basal portion of scutellum, the postscutellum, and a mark roughly V-shaped on each side of the posterior face of the median segment, pale yellow. Abdomen black; petiole at the base, apex, and laterally, abdominal segment 2 at base and with broad apical fascia, following segments with apical fasciæ, pale yellow.

Legs chiefly pale yellow, the anterior femora and intermediate femora and tibiæ streaked with black, first joint of posterior tarsi marked with black.

Antennæ ferruginous, scape darker above.

Wings clear hyaline, slightly fuscous in radial cell.

Head about as broad as thorax, genæ very short.

Prothorax with the posterior margins distinctly raised and rounded. Petiole slender, of almost uniform width, about as long as thorax; second abdominal segment cup-shaped, narrow, gradually widening to apex.

Length 10 mm.

Hab. Dupulán Baktiari, S.W. Persia (*Escalera*); 1 ♀.

Distinct from *P. persica* by the shorter petiole and differently shaped second abdominal segment.

In *P. persica* the second abdominal segment is as broad at the apex as its entire length, in *P. escalerœ* it is one and a quarter times as long as broad at the apex, and has an altogether more slender appearance.

The whole insect has a paler appearance, and is easily distinguishable at a glance, though, were it not for a structural difference, it might be considered a variety.

Polybia (*Parapolybia*) *melaina*, sp. n.

♀. Nigra; clypeo facieque sparse testaceo-variegatis, alis fuscis.

Black; two small spots at the apex of the clypeus and two marks on the inner orbits of eyes below the sinus pale testaceous.

Wings fuscous.

Head broader than thorax, petiole long and slender, broader along apical half, the whole about as long as the thorax. Second abdominal segment cup-shaped, as broad as the thorax at the tegulæ, the width at apex about equal to the length. The whole insect shining, impunctate.

Length 9 mm.

1 ♀.

♂. Differs from the female in the following respects:— Clypeus totally, except for a median longitudinal streak,

almost reaching to the apex, mandibles, the inner margin of the eyes (including the lower portion of the sinus), the intermediate coxæ beneath, and the second abdominal sternite pale testaceous.

Hab. Between Salt Lake and Wawamba, near Mount Ruwenzori, Uganda (*Scott Elliot*).

The only other known African species of *Polybia* is *P. tabida*, F., the type of which is in the Banksian Collection.

Megacanthopus, Ducke.

Megacanthopus pallidipectus.

Polybia pallidipectus, Smith, Cat. Hymen. Brit. Mus. v. p. 128. no. 36 (1857).

Type in British Museum.

Megacanthopus tapuya.

Polybia tapuya, Schulz, Hymen. Stud. p. 133 (Amazons).

Type in British Museum.

Megacanthopus flavitarsis.

Polybia flavitarsis, Sauss. Étud. fam. Vespid. ii. p. 199 (1853) (California).

Type in British Museum.

Megacanthopus cubensis.

Polybia cubensis, Sauss. Étud. fam. Vespid. ii. p. 202 (1853).

Type in Paris Museum.

These four species are all referable to Ducke's genus *Megacanthopus*.

Nectarina, Shuck.

Nectarina amazonica.

Chartergus amazonicus, Cam. Zeitschr. Hymenop. vi. p. 380 (Amazonia).

Nectarina lecheguana.

Nectarina lecheguana, Latr. Mémoires du Muséum d'Histoire Naturelle, tome xi. p. 317, t. xii. pl. xii. fig. 13 (1824).
Chartergus centralis, Cam.

Nectarina azteca.

Nectarina azteca, Sauss. Revue et Magazin de Zoologie, ix. p. 280 (1857) (Mexico).
Chartergus mexicanus, Cam. Invert. Pacif. i. p. 154 (Acapulco, Mexico).

Nectarina cameroni, nom. nov.

Chartergus aztecus, Cam. Invert. Pacif. i. p. 155 (Mexico).

This species has to be renamed, as the name *azteca* already occurs in the genus.

The four species described by Cameron as *Chartergus* are thus all referable to *Nectarina*; the types are in the British Museum. It is quite possible that *N. amazonica* and *N. cameroni* belong to known species; but as the types are the only specimens, and in bad condition, it has been thought advisable to let them stand as distinct species.

Masaridæ, Latr.

A very fine collection of these insects, usually taken so sparingly, has recently been added to the collection. They were collected in the Mogador district of S.W. Morocco by Señor Manuel de la Escalera, and presented to the Museum by Mr. R. E. Turner. They are worth recording as a whole, since the locality is an interesting one.

There do not appear to be any new species, although the specimens of *Ceramius fonscolombei* seem almost worthy of subspecific rank.

Ceramius, Latr.

1. *lusitanicus*, Klug.—Mogador, xii. 1906 (*Escalera*). 8 ♀ ♀, 7 ♂ ♂.

2. *spiricornis*, Sauss.—Mogador, xii. 1906; El Kurimat, v. 1907 (*Escalera*). 9 ♀ ♀, 9 ♂ ♂.

3. *fonscolombei*, Latr.—Marrakesh, iv. 1907 (*Escalera*). 14 ♀ ♀, 12 ♂ ♂.

In the majority of specimens the second abdominal segment is almost entirely ferruginous red, though in some specimens the red markings are more reduced than in others.

Jugurthia, Sauss.

1. *oraniensis*, Lepel.—Marrakesh, iv. 1907; Amis (*Escalera*). 13 ♀ ♀, 11 ♂ ♂.

2. *numida*, Sauss.—Aglii, Amis (*Escalera*). 2 ♀, 1 ♂.

Quartinia, Grib.

1. *major*, Kohl.—Marrakesh, iv. 1907 (*Escalera*). 2 ♀, 1 ♂.

2. *dilecta*, Grib.—Mogador, xii. 1906 (*Escalera*). 1 ♀, 1 ♂.

Masaris, F.

1. *vespiformis*, F.—Marrakesh, iv. 1907 (*Escalera*). 17 ♀ ♀, 14 ♂ ♂.

Celonites, Latr.

1. *abbreviatus*, Vill.—Amis (*Escalera*). 1 ♀, 1 ♂.

2. *fischeri*, Spin.—Marrakesh, iv. 1907 (*Escalera*). 6 ♀ ♀, 3 ♂ ♂.

XI.—*Three new South-American Mammals.*

By Oldfield Thomas.

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Molossops mastivus, sp. n.

Allied to *M. cerastes*, but larger.

Size largest of the genus. Fur very close and velvety, hairs of back barely over 2 mm. in length. Structure of ears and distribution of fur as in *M. cerastes*. General colour above dark chocolate-brown, rather paler below.

Skull like that of *M. cerastes*, but decidedly larger; ridges and crests much more developed, the "helmet" formed by the junction of the sagittal and lambdoid crests very prominent. Muzzle rather narrower in proportion to the length of the skull, and not so markedly flattened. Brain-case also less flattened above. Anteorbital ridges very heavy. Rami of lower jaw very short and thick, their lower profile convex from end to end.

Teeth about as in *M. cerastes*, the canines longer and heavier.

Dimensions of the type (measured in skin) :—

Forearm 49 mm.; third finger, metacarpus 49, first phalanx 20; fifth finger, metacarpus 26, first phalanx 11·5.

Skull: greatest length, gnathion to tip of occipital crest 23·8; condylo-basal length 22·3; zygomatic breadth 16·5; breadth of muzzle 11; interorbital breadth 5·5; mastoid breadth 15·5; height of canine 4·8; front of canine to back of m^3 8·8. Height of lower jaw below m_1 3·5.

Hab. Demerara. Type from Bartica Grove, Lower Essequibo.

Type. Old male. B.M. no. 10. 11. 10. 3. Collected by Cozier and presented by F. V. McConnell, Esq.

Related to *M. brachymeles* of Peru and *M. cerastes* of Paraguay and S. Brazil, but markedly larger than either.

Rhipidomys bovallii, sp. n.

A very large species, with grey-based belly-hairs.

Size, as judged by the length of the tooth-row, larger than in any other species. Fur long and thick, hairs of back about 11 mm. in length, the long bristle-hairs surpassing them by 4–5 mm. General colour above the usual dull fulvous grey, darker along the median dorsal area, clearer on sides. Under surface dull creamy, the hairs slaty for rather more than half their length; lateral line of demarcation little marked. Hands and feet dark, the hallucal edges whitish. Tail dark brown as usual, very heavily haired, especially at the tip, where the hairs attain a length of 25 mm.

Skull with rather narrow nasals and narrow interorbital space. Palate much less broad than in *Rh. lucullus*.

Dimensions of the type (measured on the skin) :—

Head and body 180 mm.; tail 198; hind foot 33.

Skull: nasals 15; interorbital breadth 5·6; diastema 11·2; palatal foramina 8·6; breadth across outside m^2 8·2; length of upper molar series 6·8.

Hab. Potaro Highlands, towards Mt. Roraima, British Guiana. Alt. 2000′.

Type. Adult. B.M. no. 7. 6. 10. 3. Collected 10th November, 1905, and presented by Dr. Carl Bovallius.

This fine species appears to be a Guianan representative of the *Rh. leucodactylus* group of Peru. From *Rh. sclateri*, the only other Guianan species at all allied to it, it differs by its larger size, longer coarser fur, and more fulvous colour.

Rhipidomys lucullus, sp. n.

A large species, with grey-based belly-hairs and broad palate.

General external appearance very much as in *Rh. leucodactylus*, Tschudi, to which I refer specimens from Marcapata and Ocabamba. But while the belly-hairs of *leucodactylus* are grey-based laterally and wholly white down the centre of the belly, in *lucullus* they are grey-based throughout. Tail more heavily haired than in *leucodactylus*, the hairs of the terminal tuft attaining 15–17 mm. in length. Feet coloured as in *leucodactylus*.

Skull with rather larger brain-case than in *leucodactylus*. Nasals very narrow. Supraorbital space narrow, its edges nearly parallel, with faintly indicated postorbital projections. Palate broader than in *leucodactylus*, especially behind, the two molar series almost diverging posteriorly, and the breadth across the narrowest point on the bone behind the molars at the anterior base of the pterygoids conspicuously greater; the mesopterygoid fossa also broader.

Dimensions of the type (measured in the flesh by the collector):—

Head and body 180 mm.; tail 220; hind foot 34.

Skull: greatest length 41·5; basilar length 33; zygomatic breadth 23·3; nasals 8·2 × 4·5; interorbital breadth 5·7; breadth of brain-case 17·3; palatilar length 17·5; diastema 11; palatal foramina 8·3; breadth between outer sides of m^3 8·7; outside breadth across necks of pterygoids 7·1; breadth of mesopterygoid fossa 3·4; upper molar series 6·8.

Hab. Garita del Sol, Valley of Vitoc, Upper Perené, Central Peru. Alt. 5700′.

Type. Adult female. B.M. no. 94. 10. 1. 11. Collected by J. Kalinowski, 5th July, 1891. Received in exchange from the Branicki Museum.

Readily distinguishable by the grey-based belly-hairs and he various cranial characters described.

XII.—*Diagnoses of new Mammals from the Trengganu Archipelago, East Coast of the Malay Peninsula.* By C. Boden Kloss.

The following are diagnoses of new mammals obtained by Mr. C. Boden Kloss in the Redang, Perhentian, and other small islands off the coast of Trengganu. Full descriptions,

with a complete account of the collections made, will be published in the 'Journal of the Federated Malay States Museums.'

Presbytis obscura styx, subsp. n.

A local race of *P. obscura*, characterized by dark colour and absence of any reddish-bronze area on shoulders and anterior middle back. Upper parts and outer sides of fore limbs black; outer sides of hind limbs dark ashy grey; under parts dark brown, nuchal patch drab-grey, hands and feet intense shining black, tail silvery ashy-grey.

Hab. Perhentian Islands near Trengganu, East Coast of the Malay Peninsula (type from East Perhentian Island).

Type. Adult male. S.M. 2061/10. Collected 12th September, 1910. Original number 3634.

Seven specimens examined.

Macaca irus argentimembris, subsp. n.

A macaque of medium size, differing from *M. irus* and *M. lætus* in the more restricted and less annulated ochraceous area of the upper parts, more silvery limbs, and more concave nasal profile.

Top of head and back indistinctly annulated ochraceous and black, rapidly becoming silvery on sides of head and body, limbs, under parts, and on tail except the outer basal part, which is greyish black.

Hab. Great Redang Islands, near Trengganu, East Coast of the Malay Peninsula (type from Pulau Pinang).

Type. Adult male. S.M. 2068/10. Collected 4th September, 1910.

Four specimens examined.

Tupaia obscura, sp. n.

An island race of *Tupaia* closely resembling *T. belangeri*, but smaller and slightly more tawny, buff shoulder-stripes much larger and more distinct, and the underside of tail yellower. The paler and longer tail is alone sufficient to distinguish it from *T. lacernata*.

Hab. Great Redang Islands, near Trengganu, East Coast of the Malay Peninsula (type from Great Redang).

Type. Adult male. S.M. 2279/10. Collected 2nd September 1910.

Sixteen specimens examined.

Tupaia ferruginea longicauda, subsp. n.

Closely resembles *T. ferruginea,* but has a much longer tail, is lighter and less rufous above, and yellower below; the tail and feet are paler and the buffy colour of the throat extends up the sides of the neck and behind the ears to meet the shoulder-stripes.

Hab. Perhentian Islands, near Trengganu, East Coast of the Malay Peninsula (type from East Perhentian Island).

Type. Adult male. S.M. 2295/10. Collected 8th September, 1910.

Twenty-four specimens examined.

Crocidura major, sp. n.

A large member of the subgenus *Crocidura*, larger than *C. fuliginosa* (of Blanford) and duller in colour above; approaching in size *C. lepidura*, though with a relatively smaller foot, but larger than any other Sumatran or Indian form of the section. About the same size as *C. baluensis*, but with smaller tail and foot and less dense fur.

Hab. Great Redang Islands, near Trengganu, East Coast of the Malay Peninsula (type from Great Redang).

Type. Adult male. S.M. 2573/10. Collected 31st August, 1910.

Three specimens examined.

Sciurus vittatus scottii, subsp. n.

Like *S. miniatus*, but considerably smaller (greatest length of skull about 45 mm.); paler and duller above; the rufous abdomen sown with white hairs, dark lateral stripe reduced and less intense, buff stripe narrower and paler.

Hab. Little Redang Island (Pulau Bedung), south of Great Redang Islands, East Coast of the Malay Peninsula.

Type. Adult female. S.M. 2078/10. Collected 29th August, 1910. Original number 3360.

Eight specimens examined.

Sciurus vittatus plasticus, subsp. n.

Like *S. scottii*, but a little larger (greatest length of skull about 46·5 mm.); the buff element in the upper pelage greater in quantity, the dark lateral stripe more clearly defined, rufous area of underside not extending so far up the throat, white hairs practically absent on the abdomen, and the caudal pencil reduced. Skull with markedly longer rostrum.

Hab. Great Redang Islands, East Coast of the Malay Peninsula (type from Great Redang).

Type. Adult female. S.M. 2159/10. Collected 1st September, 1910. Original number 3399.

Twenty-six specimens examined. The series ranges from individuals with the appearance of the type to others with the upper surface a speckle of black and bright golden, in which the dark lateral stripe is completely absent.

Sciurus vittatus perhentiani, subsp. n.

Like *S. plasticus* and *S. scottii*, but a little larger (greatest length of skull about 47·7 mm.), with the buff element of the upper surface deeper and the tail yellower, the pale lateral stripe broader and deeper in tint; the dark lateral stripe broader and less obscured. Skull with combined nasals broader anteriorly and the frontal bone with greater posterior extension.

Hab. West Perhentian Island, near Trengganu, East Coast of the Malay Peninsula.

Type. Adult male. S.M. 2172/10. Collected 11th September, 1910. Original number 3609.

Twenty-nine specimens examined.

Sciurus vittatus proteus, subsp. n.

Differs from *S. perhentiani* in being much paler above, and has the rufous of the under parts replaced by buff. The dark lateral stripe is much obscured by the buff tips of its hairs. From *S. lutescens* and other allied races from the Natuna Islands it differs in the possession of a notable rufous pencil to the tail.

Hab. East Perhentian Island, near Trengganu, East Coast of the Malay Peninsula.

Type. Adult male. S.M. 2094/10. Collected 13th September, 1910. Original number 3654.

Fifty-two specimens examined. The series ranges from individuals of the appearance of the type to others closely resembling *S. perhentiani*, but slightly paler above, with the dark lateral stripe reduced to a breadth of less than 5 mm. by the superficial extension of the rufous abdomen.

Sciurus vittatus watsoni, subsp. n.

Most nearly resembles *S. subluteus*, but is smaller and paler above, with yellower feet. Lateral pale stripe much broader and darker, dark stripe much shorter and much

obscured by grizzling. Greatest length of skull about 45 mm., but nasals longer than those of *S. miniatus*.

Hab. Lantinga Island, between the Pedang and the Perhentian Islands, East Coast of the Malay Peninsula.

Type. Adult male. S.M. 2085/10. Collected 6th September, 1910. Original number 3500.

Nine specimens examined.

Sciurus tenuis sordidus, subsp. n.

A small insular race of *S. tenuis* characterized by dull pelage similar to that of *S. t. surdus*, and by the even terminations of the nasals, which are in a line with the posterior extremities of the premaxillaries.

Hab. Great Redang Islands, near Trengganu, East Coast of the Malay Peninsula (type from Great Redang).

Type. Adult female. S.M. 2407/10. Collected 2nd September, 1910. Original number 3720.

Ten specimens examined.

Mus surifer grandis, subsp. n.

A large member of the *surifer* group, characterized by the markedly robust skull and unusually heavy rostrum, which is deeper and possesses broader and longer nasals than in any other race. Colour less bright than in the typical *M. surifer*.

Hab. Great Redang Islands, near Trengganu, East Coast of the Malay Peninsula.

Type. Adult male. S.M. 2206/10. Collected 2nd September, 1910. Original number 3698. (Type from Great Redang.)

Fourteen specimens examined.

Mus surifer flavigrandis, subsp. n.

In size subequal to *M. s. grandis*, but with a larger hind foot. Pelage somewhat brighter, sides of muzzle and lower cheeks yellow, not white, and white area of throat much narrower. Skull generally similar and equally robust, but the nasals extending posteriorly beyond the lachrymal notches.

Hab. East Perhentian Island, near Trengganu, East Coast of the Malay Peninsula.

Type. Adult male. S.M. 2220/10. Collected 12th September, 1910. Original number 3682.

Nine specimens examined.

XIII.—*The Anatomy and Classification of the Teleostean Fishes of the Order Iniomi.* By C. Tate Regan, M.A.

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The Iniomi are marine malacopterous physostomes with the pelvic fins abdominal or thoracic in position and the pelvic bones free from the cleithra; an adipose dorsal fin is typically present, the præmaxillaries exclude the maxillaries from the gape, the gill-openings are wide, the pectoral arch is attached to the skull by a forked post-temporal, there is no mesocoracoid, the vertebral centra are coossified with the arches, the air-bladder is small or absent, and the ovaries are provided with oviducts.

The families Rondeletiidæ and Cetomimidæ are known only from a few specimens taken in deep water; they presumably pertain to this order, for the præmaxillaries form the upper border of the mouth, but these fishes differ from the rest in the posterior position of the dorsal fin, which is opposed to the anal. They will probably form a distinct suborder when they are better known.

Of the Cretaceous fishes which may pertain to the Iniomi the Chirothricidæ are probably related to the Aulopidæ or Sudidæ, but the Enchodontidæ appear to me to show more agreement with the Stomiatidæ than with the Alepidosauroids, to which Smith Woodward considers they are related. The Dercetidæ are of uncertain relationships, but the orbital and postorbital parts of the skull and the post-temporals show considerable resemblance to *Evermanella* (*Odontostomus*), whilst the ethmoid region and jaws are more like those of *Alepidosaurus*. Of the fishes placed by Smith Woodward in the Scopelidæ many are of very doubtful position, but *Sardinioides crassicauda* and *illustrans* certainly belong to the Aulopidæ. Other species referred to *Sardinioides* resemble *Neoscopelus* or *Chlorophthalmus*, to which *Acrognathus* may be related. *Apateodus* is probably near *Alepidosaurus*.

The skeletal characters of the Iniomi have not hitherto received much attention. Günther has figured the pectoral arch of *Omosudis* and *Bathypterois* ('Challenger' Deep-sea Fishes). Gill has pointed out that in several families the post-temporals "impinge upon the occiput." Smith Woodward has figured the head skeleton of *Aulopus* for comparison with *Sardinioides* (Palæontograph. Soc. 1902).

Suborder 1. Myctophoidea.

Caudal well-developed, free from the anal; pectorals lateral; pelvics 6–11 rayed, below or behind the pectorals. Mouth terminal, not or but little protractile. Palatine normally developed, its anterior end attached to the vomer, with a process directed upwards and outwards which overlaps the proximal end of the maxillary and is supported by a lateral projection of the mesethmoid; interoperculum not reduced. Cleithrum attached to supracleithrum at the lower end of the latter; postcleithrum, when present, laminar, attached by its anterior edge to inner face of supracleithrum or cleithrum.

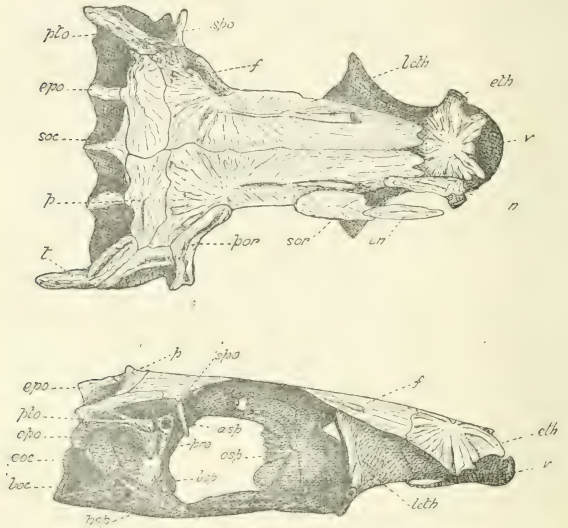
Family 1. Aulopidæ.

The fishes of the genus *Aulopus* are in many ways the most generalized members of the order; the form is moderately elongate, little compressed; the scales are of moderate size; the eyes are lateral and the slightly protractile terminal mouth is rather wide, the maxillary extending back to below the posterior part of the eye or beyond; the maxillary is dilated posteriorly and bears two supramaxillaries; the small conical teeth form narrow bands in the jaws and on the palate, the palato-pterygoid bands being connected in front by that of the vomer. The branchiostegal rays are long, curved and rather numerous (10 to 16), the dorsal fin commences a short distance behind the head and is rather elongate, and the widely separated 9-rayed pelvic fins are inserted below or a little behind the pectorals, which are placed rather low down on the sides. There is no air-bladder.

The skeleton of *Aulopus* is well ossified; the skull is rather elongate, without crests on the flattish upper surface, which is nearly at right angles to the posterior surface. The parietals meet above the supraoccipital and with the pterotics roof the posterior temporal fossæ; the cranium broadens out behind the orbits and the sphenotic has a prominent process directed outwards and downwards; the subtemporal fossa is moderately deep; the orbitosphenoid is a vertical lamina extending from the frontals to the parasphenoid and forming a septum in the anterior half of the interorbital region; posteriorly it is separated from the alisphenoids by a pair of inferior ridges of the frontals; the parasphenoid widens out anteriorly on each side into a broad lamina which unites with the lower edge of the lateral ethmoid; the latter is well ossified, but is separated from its fellow by a wide interspace;

the mesethmoid appears as a large plate overlying the vomer and has a lateral process on each side supporting an upwardly directed process of the anterior part of the palatine, in front of which that bone is suturally united with the vomer; the well-developed mesopterygoid overlaps the parasphenoid; the series of circumorbitals is noteworthy for the firm attachment of the supraorbital to the lateral ethmoid and frontal

Fig. 1.

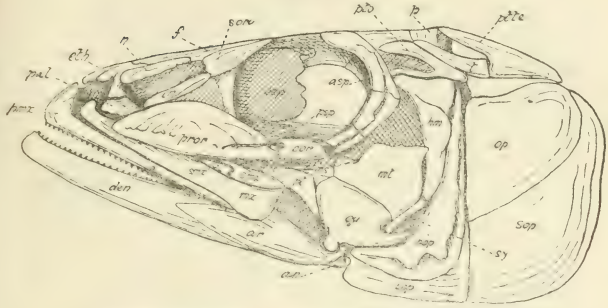


Skull of *Aulopus filamentosus*, from above and from the side.

v, vomer; *eth*, mesethmoid; *leth*, lateral ethmoid (præfrontal); *n*, nasal; *in*, infranasal; *sor*, supraorbital; *por*, postorbital; *f*, frontal; *p*, parietal; *soc*, supraoccipital; *eoc*, exoccipital; *boc*, basioccipital; *spo*, sphenotic (postfrontal); *pto*, pterotic; *epo*, epiotic; *opo*, opisthotic; *pro*, prootic; *psp*, parasphenoid; *bsp*, basisphenoid; *asp*, alisphenoid; *osp*, orbitosphenoid; *t*, temporal plate (lateral dermo-occipital).

and of the uppermost postorbital to the frontal and sphenotic; there is a well-developed infranasal; the opercular bones are remarkable for the great development of the suboperculum, which forms the entire posterior margin of the gill-opening; the branchiostegals also are long and curved upwards.

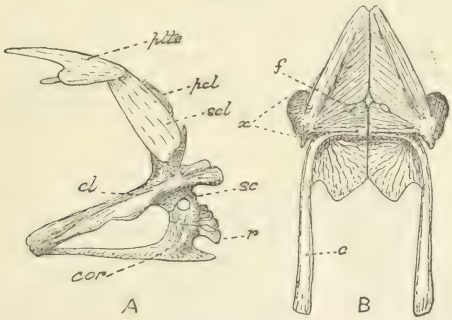
Fig. 2.



Aulopus filamentosus; lateral view of skeleton of head.

pmx, præmaxillary; *mx*, maxillary; *smx*, *smx'*, supramaxillaries; *den*, dentary; *ar*, articulare; *an*, angulare; *pal*, palatine; *pt*, pterygoid; *ms*, mesopterygoid; *mt*, metapterygoid; *qu*, quadrate; *sy*, symplectic; *hm*, hyomandibular; *pop*, præoperculum; *op*, operculum; *sop*, suboperculum; *iop*, interoperculum; *n*, nasal; *in*, infranasal; *pror*, prærorbital; *cor*, circumorbitals; *sorb*, supraorbital; *osp*, orbitosphenoid; *asp*, alisphenoid; *psp*, parasphenoid; *eth*, mesethmoid; *f*, frontal; *p*, parietal; *pto*, pterotic; *t*, temporal plate; *ptte*, posttemporal.

Fig. 3.



Aulopus filamentosus.

A. Pectoral arch. *ptte*, post-temporal; *scl*, supracleithrum; *pcl*, postcleithrum; *cl*, cleithrum; *sc*, hypercoracoid; *cor*, hypocoracoid; *r*, radials.

B. Pelvic bones. *f*, foramen; *c*, posterior process; *x*, position of base of fin.

Other features of the head skeleton are shown by the figures, and it need only be remarked that the form of the cranium, the development of the temporal fossæ, the general character and arrangement of the frontals, parietals, the otic bones, the nasals, circumorbitals, and supramaxillaries indicate a pretty close relationship to generalized isospondylous fishes such as *Elops* (*cf.* Ridewood, P. Z. S. 1904, ii. pp. 35–81, c. figg.).

The vertebral column only differs from that of the Elopidæ in that the centra are coossified with the arches; there are 52 vertebræ; the centra are perforated; the ribs and epipleurals are inserted together on very short processes which increase in length posteriorly and there is a series of epineurals; the caudal fin skeleton differs from that of the Elopidæ chiefly in that there is only one upturned centrum which is rather elongate.

The general characters of the pectoral arch and the pelvic bones are shown in the figures, and it is only necessary to say that the forked post-temporal is firmly attached to the epiotic above and the opisthotic below, and to call attention to the remarkable posterior processes of the pelvic bones.

This family includes the single recent genus *Aulopus*, with the allied Cretaceous *Sardinioides*.

Macristium, Regan, is probably related to *Aulopus*.

The genus *Scopelosaurus* (Bleeker, Act. Soc. Sci. Ned. Ind. viii. 1860, no. 5, p. 12) appears to differ but little from *Aulopus* in the head, mouth, dentition, &c. The body is very elongate, subcylindrical, and has 3 rows of luminous spots on the belly; there are 9 branchiostegals.

The vomerine teeth form a single transverse series, and this character indicates a closer relationship to *Aulopus* than to the Myctophidæ.

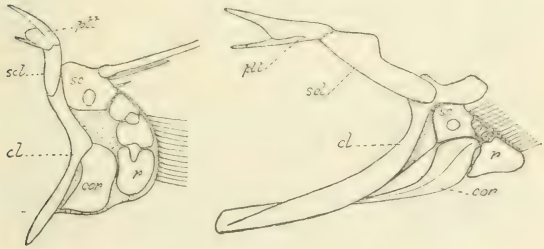
Family 2. Synodontidæ.

Differ from the Aulopidæ in certain features of specialization. The suspensorium is directed obliquely backwards and the mesopterygoid is less developed than in *Aulopus*; the mouth is wide; there is no supramaxillary, and the slender maxillary is firmly adherent to the præmaxillary or is united with it by suture or ankylosis; there are bands of curved pointed teeth in the jaws and on the palate; the branchiostegals number 11 to 17. The cranium in *Synodus* and *Saurida* is more depressed than in *Aulopus*, with the epiotics further apart and the posterior temporal fossæ much reduced in size; the parasphenoid is laminar and the orbitosphenoid forms a thin septum; the upper fork of the post-temporal

almost touches the supraoccipital, but its extremity is connected with the epiotic by a ligament. The pelvic bones are formed much as in *Aulopus*, with a pair of posterior processes which are slender in *Saurida*, short and laminar in *Synodus*. The vertebral column is as in *Aulopus*, except that there are no upturned centra at the base of the caudal fin; 53 to 62 vertebræ in *Synodus* and *Saurida*.

In addition to the two genera just named this family includes *Bathysaurus* and *Harpodon*; the latter is a highly specialized type, in which the maxillary is no longer recognizable as a separate element; the skeleton is very feebly ossified and transverse processes are not developed on the vertebræ, the ribs being sessile; apparently there is no orbitosphenoid and the frontals and alisphenoids form a complete double interorbital septum, a condition approached in *Saurida*. The pectoral arch differs from that of *Synodus* in the longer and narrower supracleithrum, the almost membranous coracoids, and the absence of the laminar expansion of the lowest radial, in the latter character agreeing with *Saurida*.

Fig. 4.



A. B.

Pectoral arch of A, *Bathypterois longifilis*; B, *Synodus lucioceps*. Lettering as in figure 3.

Family 3. Sudidæ.

Chlorophthalmus, usually placed near *Aulopus*, differs from that genus in many ways. The dorsal fin is short and the pelvic fins are close together; the maxillary bears a single supramaxillary; the vomerine teeth form two separate patches; the skeleton is weakly ossified, there is no orbitosphenoid, the parasphenoid is slender, the lateral ethmoids meet in the middle line, the anterior attachment of the palatine

to the vomer is ligamentous, the temporal fossæ are apparently not roofed, the upper limbs of the post-temporal are attached by ligament to the epiotics, but nearly meet above the supra-occipital, and the pelvic bones are simple triangular plates. I have had no skeleton, and I have ascertained these characters from examination of a spirit-specimen. The coracoids and pectoral radials are intermediate between those of *Aulopus* or *Myctophum* and *Bathypterois*. The hypocoracoid is narrowed forward below, but meets the cleithrum far above the symphysis, and the radials are compressed, but not greatly enlarged. The circumorbital and nasal bones are thin, but otherwise as in *Aulopus*. With *Chlorophthalmus* I would associate a number of genera which agree with it in the following characters at least:—

Snout obtusely rounded when seen from above; mouth terminal, with the lower jaw prominent; maxillary dilated posteriorly, with a single supramaxillary usually present. Pointed teeth forming narrow bands or a single series in the jaws and usually on the palatines; vomerine teeth, when present, forming two well-separated patches. Dorsal fin short; pectorals lateral; pelvics usually not widely separated. Skeleton rather weakly ossified; ethmoid without median keel; post-temporals nearly meeting above the supraoccipital. No air-bladder.

Synopsis of the Genera of Sudidæ.

I. Body moderately elongate, subcylindrical; head as broad as deep; snout rather short; maxillary reaching to below anterior part or middle of eye, which is large; pelvic fins below the dorsal. 1. *Chlorophthalmus.*

II. Body elongate, subcylindrical or compressed; head depressed, with the snout more or less spatulate; mouth large, the maxillary extending beyond the eye; pelvic fins in advance of the dorsal.

A. None of the fin-rays prolonged.

Eyes present, moderately large ..... 2. *Bathysauropsis.*

No eyes; a paired phosphorescent organ on the head, covered by the thin frontal bones, to the lateral edges of which the suborbitals are attached ..... 3. *Ipnops.*

B. The outermost ray of the pelvic and the lowest of the caudal excessively prolonged; eyes present, small.

Pectorals normally formed ..... 4. *Benthosaurus.*

Pectoral divided into two subcontiguous portions, the upper part 7-rayed, the first ray prolonged and bifid, the rest gradually decreasing in length below, the lower part of 5 or 6 simple filamentous rays ..... 5. *Hemipterois.*

C. Outermost pelvic ray usually bifid, or the two branches may coalesce; if short it is thick and flattened distally, if prolonged

more slender and less distinctly flattened; pectoral of two well-separated portions, the upper of a very long bifid ray, usually with 1 or 2 short rays in its axil, the lower of from 8 to 14 simple filamentous rays; lowest caudal ray not excessively prolonged; eyes present, small ..... 6. *Bathypterois.*

III. Body more or less compressed; snout more or less produced; maxillary not reaching the eye.

A. Body moderately elongate, somewhat compressed; dorsal and pelvic fins placed well forward ..... 7. *Parasudis.*

B. Body elongate, strongly compressed; dorsal and pelvic fins placed posteriorly.

No strong canines..... 8. *Paralepis* *.

Several long canine teeth on each side of the lower jaw..... 9. *Sudis.*

The new genus *Bathysauropsis* is here established for *Chlorophthalmus gracilis*, Günth. It differs from *Chlorophthalmus* in the more slender body, depressed head, somewhat smaller eyes, broader interorbital region, broader and more depressed snout, larger mouth, pelvic fins further apart and more advanced, pectorals placed higher, &c. In fact, it is in every way intermediate between *Chlorophthalmus* on the one hand and *Ipnops* and *Benthosaurus* on the other. *Ipnops* resembles it in form, scaling, structure, and position of the fins, mouth, dentition, &c., and it is open to question whether anything is gained by placing it in a different family on account of the characters of specialization indicated in the synopsis. *Benthosaurus* and *Hemipterois* (a new genus with *Bathypterois guentheri*, Alcock, as the type) lead from *Bathysauropsis* to *Bathypterois* †.

* M. Dollo (Proc. R. Soc. Edinb. xxviii. 1908, p. 59) recognizes a family Paralepidæ to include *Paralepis*, *Sudis*, and five other genera. Of these, *Notolepis*, Dollo, seems to differ from *Paralepis* only in having a longer adipose fin, and *Lestidium*, Gilb., is doubtfully distinct from *Sudis*. *Neosudis*, Casteln., and *Plagyodus* (*Alepidosaurus*) are not, in my opinion, members of this group, and *Prymnothonus hookeri* is a larval form of uncertain relationships.

† The species of *Bathypterois* may be provisionally arranged thus:—

I. Lowest pectoral ray very long..... *quadrifilis*, Günth.

II. Lowest pectoral ray not greatly prolonged.

A. Lower part of pectoral 8 or 9 rayed.

Outermost pelvic rays slightly produced..... *ater.*, Gilchr. / *indicus*, Brauer.

Outermost pelvic rays moderately produced .... *longipes*, Günth. / *dubius*, Vaill.

Outermost pelvic rays considerably produced.... *longicauda*, Günth.

B. Lower part of pectoral 10 or 11 rayed.

Outermost pelvic ray scarcely produced ..... *antennatus*, Gilb.

Outermost pelvic ray moderately produced..... *pectoralis*, Garm. / *atricolor*, Alcock.

The new genus *Parasudis*, here established for *Chlorophthalmus truculentus*, Goode & Bean, differs from *Chlorophthalmus* in that the snout is produced so that the maxillary does not reach the eye, whilst the body is more compressed and the vent is placed further back. It is clearly annectant between *Chlorophthalmus* and *Paralepis* and invalidates the claim of the latter to rank as the type of a separate family. I find that in *Paralepis* and *Sudis* the mouth structure is very similar to that of *Chlorophthalmus*; the maxillary is more slender and more adherent to the præmaxillary, but it is somewhat dilated distally and bears a long supramaxillary just as in *Chlorophthalmus*.

Family 4. Myctophidæ.

Closely related to the Sudidæ, from which they differ especially in that (1) a median keel is present on the ethmoid, and (2) the parasphenoid extends upwards to the frontals between the lateral ethmoids. As in the Sudidæ, the vomerine teeth, when present, form two well-separated patches. The body is oblong, compressed; the head is compressed, with the eyes lateral and the mouth terminal. In the more primitive genera the mouth is formed as in *Chlorophthalmus*, with the maxillary strongly expanded behind and bearing a supramaxillary; but in the more specialized forms the suspensorium is directed obliquely backwards and the slender maxillary is adherent to the præmaxillary, almost as in the Synodontidæ. In *Scopelengys*, Alcock, there are no photophores. *Neoscopelus*, Johnson, has a luminous spot on each scale of the lower part of the body, whilst in *Scopelopsis*, Brauer, every scale bears a spot. In *Myctophum* and its allies the photophores are arranged in definite groups and series. This is apparently the only family of the order in which an air-bladder may sometimes be present.

Neoscopelus is a very generalized Myctophid; the bones are thin, and the skull is less expanded behind the orbits and has the sphenotic process less prominent than in *Aulopus*. The parietals are separated by the supraoccipital, the posterior temporal fossæ are not roofed, there is no orbitosphenoid, and the parasphenoid is slender. As already indicated, the latter bone meets the frontals just behind their junction with the

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C. Lower part of pectoral of 12 to 14 rays.

Outermost pelvic ray not or scarcely produced ..	*longifilis*, Günth.
Outermost pelvic ray moderately produced	*filifer*, Gilchr. *insularum*, Alcock.
Outermost pelvic ray considerably produced	*ventralis*, Garm.

mesethmoid, so that the lateral ethmoids are separated and are almost entirely below the level of the parasphenoid; the mesethmoid bears a prominent median ridge. The jaws, the palatine attachment, and the post-temporals are as in *Chlorophthalmus*; the mesopterygoid is well-developed, but does not overlap the parasphenoid; the suboperculum and branchiostegals are not curved upwards behind the operculum; except for the post-temporal attachment the pectoral arch is very much as in *Aulopus*; the pelvic bones are small triangular plates.

There are 32 vertebræ; there are 12 pairs of ribs, the last 7 inserted on parapophyses which increase in length backwards; series of epineurals and epipleurals are present; there are 3 epurals and 2 uroneurals and the last centrum is upturned.

Lampanyctus is a much more specialized form, with slender adherent maxillary and oblique suspensorium; the skull is as broad as long, but agrees with that of *Neoscopelus* in essentials. The vertebral column has 35 vertebræ; all the ribs are inserted on parapophyses.

Suborder 2. Alepidosauroidea.

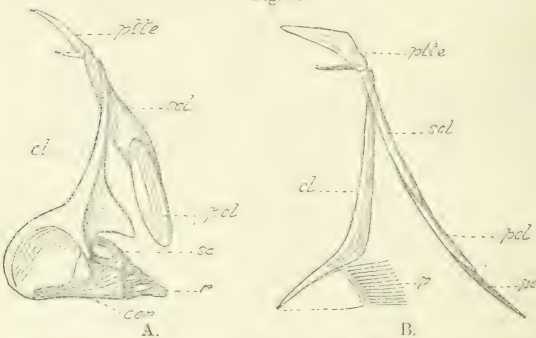
Head and body compressed; caudal well developed, free from the anal; pectorals low; pelvics 6–13 rayed, close together, far behind the pectorals. Mouth large, not protractile; strong pointed canines in the lower jaw and on the palatines; præmaxillary and maxillary long and slender, firmly united distally. Palatine large, vertically expanded anteriorly, where it is firmly attached by its upper edge to the frontal and by its inner face to the side of the ethmoidal region; mesopterygoid rather small. Præoperculum narrow, nearly vertical; suboperculum entirely below operculum; interoperculum reduced; 6 to 8 branchiostegals. Ethmoid without median keel or lateral processes; parasphenoid slender; a basisphenoid; no orbitosphenoid. Upper fork of post-temporal connected by ligament with epiotic, but nearly meeting its fellow above the supraoccipital; cleithrum attached to supracleithrum near upper end of the latter, which runs obliquely downwards and backwards and has the upper postcleithrum attached to its distal end. Pelvic bones simple rods or triangular plates. No upturned centra at the base of the caudal fin. No air-bladder.

This suborder contains a few deep-sea fishes with the skeleton rather weakly ossified.

Family 1. **Scopelarchidæ.**

Snout short. Maxillary with a small anterior expansion; a supramaxillary; canines slender, barbed, forming a regular series in the lower jaw. Skull considerably expanded behind the narrow interorbital region; parietals meeting above supraoccipital; posterior temporal fossæ not roofed; lateral ethmoids separated by an interspace; suborbitals ossified. A single laminar postcleithrum; cleithrum expanded below. 52 vertebræ; ribs on short processes. Dorsal fin short.

Fig. 5.



A. Pectoral arch of *Evermanella hyalina*; from within.
B. Pectoral arch of *Omosudis lowii*; external view, with the coracoids and radials not exposed.

ptte, post-temporal; *cl*, cleithrum; *scl*, supracleithrum; *pcl*, *pcl'*, postcleithra; *sc*, hypercoracoid; *cor*, hypocoracoid; *r*, radials; *p*, fin-rays.

Scopelarchus, Alcock, seems to be more primitive than the other genera. As described and figured it has the head, mouth, teeth, &c. of *Evermanella*, but the dorsal fin is more advanced, there are traces of small scales in addition to the large scales of the lateral line, and the eyes, described as having the visual axis superior rather than lateral, are probably not formed as in *Evermanella*. *Neosudis*, Castelu., may pertain to this family. In *Evermanella*, Fowler (*Odontostomus*), and *Dissoma*, Brauer, the eyes can look upwards or outwards, being lodged in a vertical pocket which is covered externally by a transparent membrane. The skeletal characters given are those of an example of *Evermanella hyalina*.

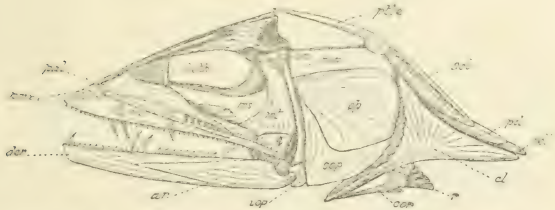
Family 2. Omosudidæ.

The genus *Omosudis*, Günther, agrees with the Scopelarchidæ in its moderately elongate form and short dorsal fin but it has the head, mouth, and teeth of the Alepidosauridæ. It differs from both in the pectoral arch, for the cleithrum is not expanded and the postcleithra are long and slender and reach the ventral profile.

Family 3. Alepidosauridæ.

Body very long, strongly compressed, naked. Snout produced, pointed; maxillary with a large triangular laminar expansion anteriorly; no supramaxillary; teeth compressed; lower jaw with one or a pair of canines on each side. Skull triangular in form when seen from above, gradually increasing in width backwards; interorbital region flat, moderately broad; parietals separated by the supraoccipital; posterior

Fig. 6.



Alepidosaurus ferox; lateral view of skeleton of head and pectoral arch. Lettering as in figures 2 and 5.

temporal fossæ not roofed; lateral ethmoids meeting in the middle line; suborbitals not ossified. Postcleithra laminar; cleithrum much expanded, triangular or triradiate in form. 51 vertebræ; centra long, without transverse processes; ribs slender, sessile. Dorsal fin very long, of simple non-articulated rays.

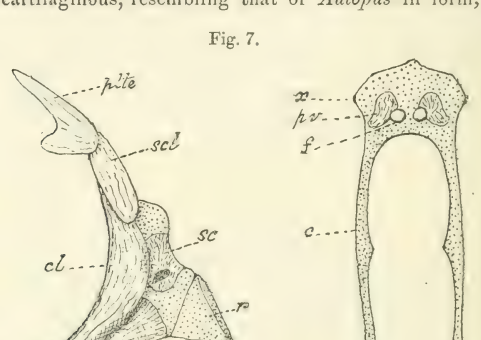
The skeletal characters given are those of an example of *Alepidosaurus ferox*.

The Cretaceous *Apateodus* is known from the skull, jaws, and teeth, which seem to be very similar to those of *Alepidosaurus* and *Omosudis*.

Suborder 3. Ateleopoidea.

Body elongate, naked ; dorsal short, just behind the head ; anal long, united to the reduced caudal ; pectorals lateral ; pelvics in advance of the pectorals, well separated, each of a simple or bifid ray with or without a vestigial ray in its axil. Mouth small, subterminal, protractile downwards ; jaws with bands of small villiform teeth ; one supramaxillary. Suboperculum excluding operculum from margin of gill-opening ; branchiostegals 6 to 8, curved upwards. Cranium in great part cartilaginous, resembling that of *Aulopus* in form, the

Fig. 7.



Ateleopus indicus.

A. Pectoral arch. *ptte*, post-temporal; *scl*, supracleithrum; *cl*, cleithrum; *sc*, hypercoracoid (scapula); *cor*, hypocoracoid; *car*, cartilage to which pelvis is articulated; *r*, cartilage representing radials.

B. Pelvis. *pv*, pelvic ossifications; *f*, foramina; *c*, posterior cornua; *x*, place of insertion of fin-ray.

posterior surface nearly vertical with a small occipital crest, the upper surface flattish, much broadened behind the orbits; frontals separated by a wide fontanel except posteriorly ; parietals separated by the supraoccipital ; epiotics and opisthotics absent ; pterotic large, separated from exoccipital by cartilage ; sphenotic with a prominent process, as in *Aulopus* ; basisphenoid, alisphenoids, and orbitosphenoid absent. Pectoral radials represented by a cartilaginous plate ; pelvis represented by a cartilaginous plate containing two small

ossifications; it bears a pair of long posterior cornua and is movably articulated to the lower surface of the coracoid cartilages. No air-bladder.

Family Ateleopidæ.

The genus *Ateleopus* or *Podateles*, with four species from the Indo-Pacific, was placed by Günther near the Macruridæ. Boulenger examined the pectoral arch in *Ateleopus indicus*, and finding that the foramen was intrascapular placed it near the Ophidiidæ among the jugular Acanthopterygians. In a paper read at the Zoological Congress of 1907 I made this genus the type of a separate order, Chondrobrachii, pointing out the improbability that it was related to fishes such as the Blennioids, which have the pelvic bones directly attached to the cleithra above the symphysis.

The evidence of relationship to *Aulopus* now seems to me so clear that I am disposed to abandon the order Chondrobrachii. *Ateleopus* scarcely differs more from *Aulopus* in fin-structure than *Coilia* does from *Engraulis*, and it is especially noteworthy that the many-jointed simple or bifid pelvic ray is exactly similar to the outer pelvic rays of *Aulopus*; it has been wrongly described as two rays bound together; rather it is the two components of one ray which remain distinct and may separate from each other distally. The resemblances and differences in the pectoral arch and pelvis will be seen on comparing figures 3 and 7. The resemblances in the skull have already been pointed out, but the skeletal differences, mainly due to degeneration or to a persistence of the conditions usually found in very young fish, seem to justify the recognition of a separate suborder for *Ateleopus*.

XIV.—*A Description of* Venus stimpsoni, *Gould*.

By A. J. Jukes-Browne, B.A., F.R.S., M.M.S.

[Plate IV.]

The shell now described and figured (Plate IV.) was first made known and briefly described by A. G. Gould in 1861 * and 1862 †, but was not figured by him, nor has any subsequent writer published a figure of it, probably because very

* Boston Soc. Nat. Hist. vol. viii. (1861).

† 'Otia Conchologica,' p. 169 (Boston, 1862).

few specimens have come into the possession of conchologists.

Having recently received a shell from Mr. Y. Hirase, of Kyoto (Japan), which I felt sure must be *V. stimpsoni*, as it was clearly a *Mercenaria*, and that is the only Japanese species of the group, I wrote to Mr. E. A. Smith about it. He sent me a copy of Gould's description, but informed me that the Museum did not possess a specimen, and advised me to have the shell compared with the type in the United States Museum. Accordingly I sent it to Dr. P. Bartsch, who has kindly compared it with the type and informs me that it is undoubtedly the *V. stimpsoni* of Gould.

Under these circumstances it seems desirable that the shell should be figured and more fully described in English, for Gould's description was in Latin only, and ran as follows :—

"*Venus* (*Mercenaria*) *stimpsoni*. T. [*i. e.* Testa] solida, cinerea, ovato-cordata, satis convexa, laminis erectis concentricis confertis dispositè ornata ; umbonibus antemedianis eminentibus, acutis, approximatis ; facie dorsali anticâ concavâ ; lunulâ profundâ ; extremitate anticâ compressa, rotundata ; facie dorsali posticâ arcuata, declivi, impressa, nihil nisi striata ; extremitate posticâ satis acutâ : cardo validus; cavositas et apophysis ligamentalis aurantiaci ; sinu siphonali minime profundo ; margine interna simplici. Long. 3·7 ; alt. 3·3 ; lat. 1·7 poll. Inhabits Hakodadi, 6 fathoms."

The *Mercenaria* group belongs to what should be regarded as the restricted genus *Venus*, though I have come to that conclusion on different grounds from Dr. Dall, and differ from him in regarding the genus as a much more comprehensive group, for I can see no generic distinction between it and *Chione*.

The characters possessed in common by *Mercenaria* and *Chione* are : that the external sculpture of the shell is more or less cancellate, the concentric lamellæ predominating, but the radiate riblets show themselves in the crenulated inner margins of the valves ; that the lunule is impressed and the escutcheon is well defined ; that all have a thick hinge-plate, bearing three cardinal teeth, but no lateral s ; and, finally, that the pallial sinus is small, triangular, and pointed.

Mercenaria differs from the typical *Chione* in always having a rugose area on the nymphal plate of the right valve and on the back of the posterior tooth of the left ; such areas being only present in a few species of *Chione*. The posterior and middle teeth of the right valve are deeply grooved or

bifid, as also is the median of the left; whereas in many of the adult *Chione* the teeth are entire or only feebly grooved.

Specifically *Venus stimpsoni* may be described as follows:—Shell large, solid, triangularly-ovate, more attenuated posteriorly than other species, the postero-dorsal slope being flattened and elongated so as to meet the postero-ventral slope in an angle which approximately subtends the median transverse diameter of the shell. The anterior side is evenly rounded and somewhat compressed. The specimen measures a little over $3\frac{1}{2}$ inches in length by $2\frac{3}{8}$ in height; more accurately it is 9 cent. long by 7·3 cent. high across the middle of the shell.

The sculpture consists of numerous low concentric lamellæ which are very close-set on the two sides and near the ventral border of the valves. On the central part of each valve the spaces between the lamellæ are striated concentrically but irregularly, and are also crossed by faint radiating lines. The valves are somewhat compressed, so that the width from centre to centre is less than in *V. mercenaria* and the shell is consequently less ventricose.

The internal characters are like those of *V. mercenaria*, but the rugose areas of the hinge are narrower and less pronounced. The pallial sinus is rather smaller, and the muscular scars rather larger than in the type species. The crenulated inner margin of the valves is very narrow and the crenulations on the lunular margin are faint. Still the margins are not "*simple*" as stated by Mr. Gould; possibly his specimen was somewhat worn.

The *Mercenaria* section of *Venus* is almost entirely American, *V. stimpsoni* being the only species yet recognized outside American waters, though some Australasian species, such as *V. yatei*, Gray, and *V. alata*, Reeve, come very near to it.

There are two species on the east coast of America, *V. mercenaria*, Linn., and *V. campechiensis*, Gmelin (= *V. mortoni*, Conrad). Two also occur on the west coast, viz., *V. kennicotti*, Dall, and *V. apodema*, Dall, but both are very rare. *V. stimpsoni* is probably most nearly allied to *V. kennicotti*, for Dr. Dall describes this latter species as being yellowish white in colour and closely lamellose over the whole surface; he also says "the rugose area of the hinge is more narrow and delicate than in the Atlantic species, but this area is still further diminished in the Japanese *V. stimpsoni* (Gould), the only exotic species of the group."

Mr. Hirase informs me that the specimen which he sent me came from Yanohe, in the province of Mutsu. This forms the northern end of Hondo, the main island of Japan, and is not far from Hakodate, which is a port near the southern end of the North Island (Hokkaido). The locality is therefore near that given by Gould.

EXPLANATION OF PLATE IV.

Venus stimpsoni, nat. size.

XV.—*Notes on the Lamellicorn Beetles of the Genus* Golofa, *with Descriptions of Three new Species.* By Gilbert J. Arrow.

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Amongst the most remarkable and fantastic of all the Dynastinæ, if not of all insects, are the large species of the genus *Golofa*. The number of species of this genus is now fairly considerable, but they are extremely close and difficult to discriminate, especially when not at their maximum development. Their nomenclature is also in the greatest confusion, the figures and descriptions of the ancient authors being invariably insufficient for exact determination. Most of the originals of these have vanished, but I have carefully examined such types as are available in the endeavour to settle the synonymy so far as possible.

The first-described species, *Golofa claviger*, Linn., was based upon Martinet's figure in the very rare 'Planches Enluminées' of D'Aubenton, and another in Voet's 'Catalogus Systematicus Coleopterorum,' both of which were quite inaccurately cited by Linnæus, whose own copies of these works (the first a portion only with a titlepage supplied by himself) I have examined in the Linnean Society's Library. These figures seem to represent the Mexican *G. pizarro* of Hope or the closely similar S. American form, while a specimen in the Linnean Collection belongs to the West Indian (St. Vincent) species *G. guildinii*, Hope. The elytra of this specimen are black instead of red, as described by Linnæus, but as it bears no label at all there is no proof that it has not been added to the collection in later years, like so many others there. As the authors of the two figures mentioned, as well as Linnæus himself, were ignorant of the habitat, it seems impossible to fix the species except

in an arbitrary way, especially as it is not at all certain from the description of the thoracic horn ("*rarius hoc cornu palmatum est*") that it is not compiled from examples of more than one species. In this hardly-to-be-dissipated uncertainty it seems to me best to adopt the conclusion which involves the least confusion, and as the figures and references of later writers generally agree in applying the name *claviger* to the S. American species (although the thoracic horn is "palmate" *par excellence*), I prefer to adopt that view. The males of these three species may be briefly distinguished as follows:—

Prothorax strongly punctured	*pizarro*, Hope.
Prothorax very finely punctured.	
Elytra very deeply and uniformly punctured....	*guildinii*, Hope.
Elytra lightly and unequally punctured	*claviger*, L.

The thoracic horn in all the specimens of *G. claviger* I have seen is more massive than in the other species and produced into three long and sharp points. All the species of *Golofa*, however, are very inconstant and difficult to define, and I have found the genitalia afford the most valuable distinctive marks.

The second described species is *Golofa ægeon*, Drury, of which also the habitat was unknown to its describer and the type is untraced. Latreille and Guérin assigned the name to a Peruvian species and were followed by Burmeister, while Erichson considered the Colombian insect called *G. porteri* by Hope to be Drury's species, and named that figured by Latreille and Guérin *G. humboldti*. Fabricius and Olivier seem to have known the insect only from Drury's "Illustrations," and it is curious that both Drury and Olivier describe the scutellum as black and the thorax black-spotted, but omit these details from their figures. The black scutellum is, on the whole, in favour of *G. humboldti*, but the closely similar *G. eacus*, Burm., is almost equally probable. The "olive-brown" hair of the abdomen mentioned by Drury is perhaps rather less inapplicable to *G. porteri*, but the "short thick horn" of the thorax seems to exclude it. Here, again, the line of least disturbance, although little else, appears to point to the Peruvian species. This species is distinguishable from the Colombian and Venezuelan *G. eacus* by the sides of the elytra being more dilated in the male, the prothorax less punctured, more convex in front of the horn, and the latter directed more backwards and rather more strongly bent at the end.

Burmeister's *G. pelops* is not, in my opinion, specifically distinct from *G. eacus*, examination of the genitalia giving

no support to Burmeister's not very confidently expressed opinion. Dark and light females are found together and the differences in the legs of the male are those of development only.

The type of Hope's *Golofa porteri* is another of those unfortunately lost. It was described from the United Service Museum, the insects contained in which are believed to have been sold, but I have failed to obtain any clue to them. It seems to be undoubtedly the same as *Asserador hewitsoni*, Empson, of which the type is in the British Museum.

Golofa incas, Hope, was referred by Bates, although not confidently, to *G. imperialis*, Thoms. Hope's types, again, cannot be traced, but his description of the male applies only to that of *G. championi*, Bates, while that of the female (so-called) sufficiently describes certain males of low development of the same species. The armed head and the coloration described both point to the male instead of the female, and in *G. championi* a longitudinal banding, such as Hope describes, is sometimes seen. Moreover, the short *acute* thoracic horn is the most characteristic feature of this species. It has not been recorded from Mexico, but "Habitat in agris Mexicanis" is scarcely too precise to exclude Guatemala.

The males of *Golofa* have, as a general rule, three teeth to the front tibia, while the females have four. Thomson's genus *Mixigenus*, which, like Dr. Ohaus, I cannot agree with H. W. Bates in uniting with *Podischnus*, differs from *Golofa* only by the presence of the four-toothed tibiæ in both sexes, the absence of stridulatory files upon the propygidium, and the less narrowed clypeus. A species here described (*G. argentina*), while it has four teeth to the front tibia in both male and female, as in *Mixigenus*, has also the stridulatory files of *Golofa*, while the clypeus is intermediate in its form. The appearance of the prothoracic protuberance of the male cannot serve for generic separation, since it is found in every degree of development in different species of *Golofa*. It seems to me impossible therefore to regard *Mixigenus* as more than a subgenus of *Golofa*.

Golofa antiqua, sp. n.

♂. Obscure rufa, capite, cornubus suturaque nigris, corpore rarius partim aut toto nigro; capite, thoracis cornu subtus, pygidii basi corporeque subtus flavo-pubescentibus; capitis cornu gracili, recurvato, acuto, postice crebre minute tuberculato; prothorace

transverso, antice modice contracto, postice parum sinuato, angulis posticis distinctis, cornu sat angusto, antrorsum oblique producto, subtus arcuato, excavato, dense flavo-hirto, apice acuminato, haud clavato, pronoto ubique distincte punctato; scutello lato, linea profunda angulata punctisque irregularibus impresso; elytris opacis, subtiliter punctatis, stria profunda suturali aliisque obsoletis geminatis; pygidio fere omnino rugoso, subtus medio grosse punctato; pedibus anticis modice elongatis, tibiis tridentatis; mandibulis apice integris, truncatis, extus subtiliter sinuatis.

Long. 35–49 mm.; lat. max. 19–25 mm.

Hab. Colombia: Cauca Valley.

Numerous male specimens were found by Mr. W. E. Pratt. The British Museum is indebted to Colonel F. Winn Sampson for this addition to the collection.

Although varying considerably in colour from a deep brick-red to nearly black it is always of a sombre shade, which distinguishes it from all the other species of *Golofa*, with the exception of the quite dissimilar *G. imbellis*, Thoms. The armature of the male is also quite distinctive, the thoracic horn being more directed forward than usual, and in the series of 45 specimens I have examined showing much less than the normal degree of variation in its length, which in the best-developed specimens is about equal to that of the pronotum in the middle. It is neither dilated at the end, as in *G. claviger*, L., and allied species, nor very slender, as in *G. ægeon, eacus*, &c., and the species may probably be regarded as representing a primitive type showing the nearest approximation to *Spodistes* and other allied genera. The pronotum is distinctly and fairly evenly punctured, and the elytra moderately strongly, especially near the suture. A small but distinctive feature is the deep angular groove, not composed of punctures, always found upon the scutellum. This occurs also in *G. claviger*, but is absent in *G. humboldti* and inconstant in other species. The hairy clothing of the base of the pygidium and the lower surface of the body is short and inconspicuous, and the stridulatory ridges of the propygidium are fine and regular towards the margin of the segment and much better developed than in *G. eacus*.

Golofa argentina, sp. n.

♂. Castaneo-rufa, capite, pronoti medio, sutura, tibiis tarsisque plus minusve infuscatis; capite cornu gracili, recurvato, apice acuto, armato, clypeo angustato, apice bilobato, vertice grosse punctato; prothorace brevi, sat lato, polito, minute sat sparse punctato, antice medio circulariter excavato et dense fulvo-hirto,

fossæ margine superiore plerumque paulo antrorsum producto; scutello parcissime punctato; elytris irregulariter haud profunde punctatis, stria suturali distincta, apicibus crebre punctatis, propygidio crebre granulifero et fulvo-setoso, costis duabus nudis stridulatoriis; pygidio polito incurvato, antice longe fulvo-piloso, postice nudo; pectore abdominisque lateribus sat dense fulvo-hirsutis, hujus medio nitido; tibiis anticis dentibus 4 acutissimis armatis.

♀. Nigra, elytris castaneis, marginibus omnibus nigris; capite rugoso, anguste bilobato, medio paulo tuberculato, pronoto grosse et crebre, antice et lateraliter rugose, punctato; scutello sat punctato; elytris rugose punctatis, stria suturali integra; propygidio corporeque subtus ut in mari; pygidio sat punctato, basi fulvo-piloso; tibiis anticis latioribus et minus acute 4-dentatis.

Long. 34–36 mm.; lat. max. 18–19 mm.

Hab. Argentina: Cordova, Mendoza (Puerto del Inca, 8900 ft.).

With the exception of *Golofa guildinii*, attributed to the West Indies, the species of the genus are confined to the mountain chain of Central and Western S. America, and the present one, with *G. cochlearis*, Ohaus, also lately discovered in the Argentine, seem to mark the farthest southward extension of the genus. It is a shining insect, with the thorax of the male very smooth and not bearing a vertical horn, but with a circular cavity filled with velvety pubescence and its upper edge slightly produced in a horizontal direction.

The British Museum contains two males and a female which, although not taken together with either of the males, is almost certainly conspecific.

Golofa (*Mixigenus*) *pusilla*, sp. n.

Picco-nigra vel piceo-brunnea, elytris et pygidio læte flavis, sutura marginibusque anguste fuscis; ovata, parum elongata; capite rugoso, clypeo truncato; prothorace grosse et irregulariter punctato, postice sublævi, basi lateribusque rugose punctatis; scutello paulo punctato; elytris lævibus, subtilissime et parcissime punctulatis, linea suturali impressa; propygidio regulariter sat minute granulifero, absque carinis stridulatoriis; pygidio nudo, crebre punctato; pectore sat dense fulvo-hirto, abdomine nitido; tibiis anticis acute quadridentatis:

♂, capite cornu gracili recurvato, apice acuto, postice vix perspicue serrato, armato; prothorace medio tumido, antice longitudinaliter sulcato, sulco rugose punctato et parce fulvo-hirto, elevationeque longitudinaliter impresso; pygidio convexo, subtus incurvato; pedibus anticis gracilioribus.

♀, capitis medio tuberculo minuto armato; prothorace antice grosse et crebre punctato; pygidio haud incurvato.
Long. 28 mm.; lat. max. 16 mm.

Hab. Mexico: Jalisco.

This is a very small species of which the two sexes do not, as usual, differ in the colour and sculpture of the elytra. These are bright yellow, with dark margins, and very smooth. The clypeus is less narrowed than in the other species of the genus and straight in front, and the propygidium is not hairy nor provided with the usual pair of stridulatory files.

I have seen three specimens, only one of them a male, but it is probable, in view of the small size of the species, that the armature does not attain a much greater development than that of the type. There is a sharp-pointed slender horn upon the head, nearly as long as the thorax, but the latter bears only a rounded elevation, grooved along the middle, with a deep groove extending from it to the front margin and containing a few yellow bristles.

Golofa pusilla is the smallest known species, except *G. inermis*, Thoms., which is strongly punctured and without sexual armature. It is closely similar to *G. tersander*, Burm., but quite differently coloured.

BIBLIOGRAPHICAL NOTICE.

A Descriptive Catalogue of the Marine Reptiles of the Oxford Clay. Part I. By Charles William Andrews, F.R.S. London: The Trustees of the British Museum, 1910.

In this volume Dr. Andrews describes the wonderful collection of Ichthyosaurian and Plesiosaurian remains brought together during years of patient labour by Mr. Alfred N. Leeds: a collection remarkable for its completeness and the marvellous preservation of the bones. Some of these skeletons were in such perfect condition that they have been mounted as easily as if they had been obtained from freshly macerated carcases.

There is probably no one in this country so well qualified to describe and interpret these remains as Dr. Andrews; and this is apparent on every page of this work, for it is obvious that vast knowledge and ripe judgment are essential for such a task.

The Reptiles which form the subject of Dr. Andrews's masterly monograph are of peculiar interest to the evolutionist, and the author in these pages has missed none of the evidence bearing on this theme; hence those who desire fresh evidence on adaptational

development will find this volume a rich storehouse of facts and stimulating induction. Some of his facts are curious—as, for example, in the case of *Elasmosaurus*, which has a neck of enormous length (nearly 3 times the length of the body) and containing no less than 76 vertebræ. This was an adaptation enabling the creature to feed, swan fashion, in deep water, occasionally, no doubt, as the author remarks, the creature, like the Swan, secured food from yet deeper water by tilting the body into a vertical position, sustaining this position by the action of the paddles. Thus it is inferred they were shallow-water creatures living near the shore and at the surface of the water; wherein they differed from the shorter-necked Pliosaurs and the Ichthyosaurs, which were probably pelagic. These short-necked forms, furthermore, seem to have lived chiefly on cuttle-fish, at any rate the rims of the suckers of the arms and dark masses representing ink-bags have been found embedded within masses of gizzard-stones lying between the ribs of not a few specimens.

But besides these inferences as to the life-history, Dr. Andrews has brought to light a mass of facts in regard to osteology which are of the highest importance in themselves, and further, as he has shown, they have a no less deep significance when used as indices of adaptation to environment, in which connection these new facts will prove of the highest value to the selectionist.

We congratulate Dr. Andrews on the completion of his task and look forward to the appearance of the promised second part.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

November 23rd, 1910.—Prof. W. W. Watts, Sc.D., M.Sc., F.R.S., President, in the Chair.

The following communication was read:—

'The Effects of Secular Oscillation in Egypt during the Eocene and Cretaceous Periods.' By William Fraser Hume, D.Sc., F.G.S., Director of the Geological Survey of Egypt.

The main points considered in the paper are:—

A (1).—There is evidence of the gradual advance of the Cretaceous sea from north or north-east over Egypt during Upper Cretaceous times. Four stages in this advance are indicated by the geographical distribution of the Cretaceous deposits, and especially by the relations of the detrital Nubian Sandstone formation to the organic Cretaceous limestones. The four phases are:—(*a*) A North Egyptian type, in which the Nubian Sandstone entirely underlies fossiliferous beds of Cenomanian (Lower Chalk)

age. This extends across Egypt from Sinai to Baharia Oasis. (*b*) A Wadi-Qena type, developed near the head of the valley of that name, characterized by the alternation of Nubian Sandstone with fossiliferous Cretaceous beds. Three main divisions of Nubian Sandstone are recognized,—one at the base of the Campanian (in the Upper Chalk), another above the Turonian (Middle Chalk), and a third below the Cenomanian beds, but closely related and passing into them. The recognition of the type was one of the most interesting results of this year's expedition in the Eastern Desert. (*c*) A Central Egyptian or Hammama type, in which the Nubian Sandstone forms the greater portion of the Cretaceous Series, only the Danian and Campanian beds being fossiliferous limestones or shales. This section is divisible into an Eastern facies, in which *Pecten* Marls are a special feature; and an Oasis facies, characterized by a fauna of small gasteropoda, etc. in the shales, and species of *Echinocorys*, crinoids, and *Terebratulina gracilis*, etc., in a white chalk, indicating a close affinity to the White Chalk of Northern Europe. These two divisions have been linked together by the discovery of the shales with the typical Oasis and small gasteropod, etc. fauna in the same series as the *Pecten* Marls, and overlying them. The Campanian beds are characterized by the presence of phosphatic fish-beds. (*d*) A South Egyptian type has close resemblances to the Central Egyptian; but in the Campanian the phosphatic beds are inconspicuous, and a fauna of sea-urchins was discovered consisting mainly of new species.

The results of the Eastern Desert expedition of 1910 in Wadi Qena bear the strongest testimony to the Cretaceous age of the Nubian Sandstone.

B (2).—As regards the transition from the Cretaceous to the Eocene, the following points are noted:—The existence of two types of strata at the base of the Eocene: the first, the Luxor type, being fossiliferous, mainly characterized by the presence of *Operculina libyca*, etc., and largely developed in the Western Desert; the second, or Qena type, being on the other hand entirely unfossiliferous, and composed of white limestones lithologically similar to the Danian white limestone below them, but structurally different. These beds, directly underlying fossiliferous Eocene strata, are honeycombed, closely-jointed, and especially subject to erosion by water, the regularly-bedded Cretaceous strata differing in these respects.

(3) A suggestion is made that these variations may be due to fold-effects produced while the land was gaining on the sea at the beginning of Eocene times, the Qena limestones being remade Cretaceous material.

(4) Whereas in Southern Egypt Lower Eocene strata directly overlie the Danian strata, in Northern Egypt very marked unconformities exist between the Middle Eocene and the Cretaceous beds.

(5) The main palæontological differences between the Cretaceous and the Eocene are recorded, the principal feature being the sudden

incoming of the large foraminifera *Nummulites* and *Operculina*; in both formations oysters and sea-urchins are dominant, brachiopoda being almost entirely absent.

C.—In this section the distribution, zonation, and variation of the Eocene Series is considered, the main points being:

(6) The apparent uniformity of the fossiliferous Lower Eocene strata wherever developed.

(7) The lack of uniformity in the Middle Eocene strata, only the lowest zone, that of *Nummulites gizehensis*, being of wide distribution. The nature of the Eocene beds between Baharia Oasis and the depressions of Moela and the Fayum are described, zoned, and compared with the Middle Eocene in other parts of Egypt, the importance of the uppermost zone, the *Gisortia* Limestone, being emphasized.

(8) The influence of the gain of land over sea is traced through the Upper Moqattam Beds (with their increase in detrital material and disappearance of *Nummulites*) and the Calcareous Grits overlying them to the quartz-chert gravels forming the desert west of Cairo and the Fayum, which are usually considered to be Oligocene, and mark the final stages in the growth of the Oligocene continent.

The Cretaceous Period in Egypt is, therefore, one marked by the gradual gain of sea over land; during the Eocene, on the contrary, land appears to have been steadily gaining on the sea, probably accompanied by gentle fold-movements which account for the minor differences in the nature of the Eocene deposits. At the close of Eocene times and during the Oligocene Epoch, the approach of a continental phase is clearly indicated, all the stages in these varied movements being illustrated in the desert regions.

December 7th, 1910.—Prof. W. W. Watts, Sc.D., M.Sc., F.R.S., President, in the Chair.

Dr. A. S. Woodward communicated an account of recent excavations in the cavern of La Cotte, St. Brelade's Bay (Jersey), made during the present year by the Jersey Society of Antiquaries. According to the report of Mr. E. T. Nicolle and Mr. J. Sinel, shortly to be published by the Jersey Society, the cave has yielded evidence of human habitation and traces of Pleistocene Mammalia. About a hundred flint implements of the Mousterian type have been obtained, besides part of a molar of *Rhinoceros antiquitatis*, and both teeth and antlers of *Rangifer tarandus*. Human remains and teeth of *Bos* have also been examined and determined by Dr. C. W. Andrews and Dr. A. S. Woodward, to whom the whole of the collection of mammalian remains was referred. This being the first discovery of typical Pleistocene Mammalia in the Channel Islands, the Jersey Society hopes to proceed with the excavations as soon as possible.

THE ANNALS

AND

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[EIGHTH SERIES.]

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VI.—*Notes from the Gatty Marine Laboratory, St. Andrews.*—No. XXXII. By Prof. M'Intosh, M.D., LL.D., F.R.S., &c.*

[Plates V.–VII.]

On the American *Syllides verrilli*, Percy Moore, from Woods Holl, Mass.

On *Nevaya whiteavesi*, a Form with certain Relationships to *Sclerocheilus*, Grube, from Canada.

On the British *Cirratulidæ*.

On the *Cirratulidæ* dredged by H.M.S. 'Porcupine' in 1869 and 1870.

On the *Cirratulidæ* dredged in the Gulf of St. Lawrence, Canada, by Dr. Whiteaves.

On the *Cirratulidæ* dredged in Norway by Canon Norman, D.C.L., F.R.S.

1. *On the American* Syllides verrilli, *Percy Moore, from Woods Holl, Mass.*

An account of an interesting annelid, captured in the tow-net off the Marine Biological Laboratory at Woods Holl, United States of America, was lately given by an able investigator, Mr. J. Percy Moore †, under the name of *Syllides*

* In the last "Notes" *Polydora carazzi* on p. 172 appears to be identical with Mesnil's *P. caulleryi* (Bull. Sc. France et Belgique, t. xxx. p. 88, pl. iii. figs. 12–16. This paper had been overlooked).

† Proceed. Acad. Nat. Sci. Philadelphia, p. 488, text-figs. 1 & 2 (January 29, 1908).

verrilli, sp. n., and careful consideration of the description and the figures shows that besides the relationships mentioned by the author this minute form presents affinities with other types not mentioned by him.

The annelid is minute, viz. 2·5 to 3 mm., and its breadth is ·2 to ·3 mm. The prostomium is large, subquadrate, with rounded corners; eyes 3 pairs, reddish brown, the first pair evidently less important (as they are rudimentary) than the others, which lie behind, in the position usually found in Syllids, and, from the figure, the anterior pair of these has lenses. The tentacles are short, stout, and clavate, the median arising between the middle pair of eyes and the lateral near the anterior border of the prostomium. The palpi are "small, mammiliform, situated on the ventral face of the prostomium and directed downwards," nearly invisible from above. They have enlarged bases and short cirriform distal portions. Tentacular cirri of the shape of the tentacles, but they are supported by short cirrophores. The colourless body is slightly depressed, the segments increasing a little in width to the middle, the first seven (to the caudal end of the gizzard—eighth segment) being short, whilst the succeeding are longer and contain the gonads. The proboscis occupies the first three segments, is more or less cylindrical, with thick brownish chitinous lining, edentulous. The rim has a circle of ten soft papillæ. The pygidium is small and bears a median unjointed ventral style and a pair of very long unjointed cirri. The prominent foot is uniramous on all the segments in the immature worm and on the first seven of the sexually mature. The dorsal cirrus is of the same shape and size as the tentacular cirri on the first three segments. The succeeding are more slender and tapered, with the tip often differentiated as a more slender and subulate process, and they (cirri) increase in length toward the middle, again diminishing posteriorly, whilst they also become distinctly jointed or moniliform, though the author adds that there is great difference in this respect, some having the cirri much more distinctly moniliform than others, and "sometimes there is a slight but distinct alternation of longer and shorter cirri;" but these conditions are not constant. The setigerous lobe has a single spine, which ends in a rough flattened knob, is compressed and slopes inward from the salient dorsal angle. The ventral cirrus leaves the setigerous lobe near the tip, is comparatively long, and usually presents "irregular constrictions and a more slender, blunt, terminal piece." The setigerous process bears dorsally a single simple bristle, "curved and slightly thickened distally, finely toothed

along the convex side, and slightly enlarged and bifid at the end." Beneath this is a fan-like tuft of compound bristles with slightly curved shafts and somewhat long terminal pieces which are bifid at the end and with a serrated edge. Further, sexually mature examples have after segment viii. a tuft of delicate capillary bristles which spring from the posterior base of the setigerous process.

Mr. Moore refers the foregoing form to the Syllidæ, and thinks that it may be the species referred to by Verrill as having been taken at Woods Holl along with *S. setosa* *, and is perhaps the *S. longicirrata*, Œrsted, of Webster and Benedict, but is not that species as described by European authors. From typical species of the genus he points out that it differs in the small size and ventral position of the palpi.

Mr. Moore's careful description demonstrates the grounds on which the resemblances to the Syllids are based, yet there is another group with which it might be compared, viz. the Staurocephalidæ. The head (prostomium) is somewhat like that of *Autotylus* or *Myrianida*, with a median and two lateral tentacles, the eyes being arranged like those of the Syllids and *Staurocephalus*, the anterior rudimentary pair being, however, peculiar. The absence of a median tentacle in *Staurocephalus* is a divergence, but in some Staurocephalids the tentacles are more or less ringed. The body offers little that is diagnostic in general outline, but the caudal region has a pygidium with a short median style, as well as two long lateral cirri, features diverging from the Staurocephalids, which usually have only the lateral cirri. The structure of the foot is, perhaps, the most critical feature in the comparison. In Mr. Moore's form the foot is strictly uniramous on the first seven bristled segments in sexually mature forms and in all the segments in the immature annelids. In all ordinary Syllids the foot conforms to the uniramous type, having only a single spine and bristles of one character, the ventral cirrus often being fused with the lower border of the setigerous process, which usually has a different outline from that in *Syllides verrilli*. In the Staurocephalidæ the foot, on the other hand, though there is but one spine, shows a biramous tendency in so far as the bristles are in two tufts, and the upper dorsal bristles diverge in structure from the others, and, in all, the ventral cirrus is carried far out on the setigerous process.

To go more minutely into the structure of the foot of *Syllides verrilli*, the dorsal cirrus is proportionally massive

* Rep. U.S. Fish. Comm. for 1882 (1884), p. 664, footnote.

for a Syllid and ends in a conical tip, and, with the exception of the three anterior segments, the organ is more or less ringed. It therefore differs from that generally seen in the Staurocephalidæ, though obscure rings are occasionally present in these, while in the form of the conical tip it agrees with that group (Staurocephalidæ), as it also does in the absence of the tapering form so characteristic of the Syllids. The setigerous lobe again has a conical process superiorly more marked than in the majority of the Syllids, yet it is not always present in the Staurocephalids. The tip of the spine terminates in a large flattened and roughened knob, a condition approaching that observed in certain Syllids, such as *Odontosyllis ctenostoma*, *Syllis spongicola*, &c. A striking feature is the occurrence at the dorsal edge of the fascicle of bristles above the spine of a single simple bristle, which is curved, slightly thickened, and flattened distally, and with a blunt bifid tip. At first sight this bristle resembles that found in certain Staurocephalids, such as *Staurocephalus rubrovittatus*. Further, the fan of compound bristles which follows forms two groups in the text-figure, an arrangement observed in certain Staurocephalids, the large size of the terminal processes and their bifid tips also resembling those of the latter *. On the whole, therefore, the structure of the bristles would indicate relationship with the Staurocephalidæ as well as with the Syllidæ. In the sexually mature examples a tuft of long delicate capillary bristles arising from the dorsal and posterior face of the setigerous process occurs on each foot after the eighth. Such bristles occur in the sexual pelagic forms of both Syllids and Staurocephalids, and have no spine in either.

The ventral cirrus, from its proportionately great length and slightly crenate condition, diverges from that usually found in the Syllidæ or Staurocephalidæ, yet it agrees with both in being borne by the setigerous lobe, and, as a rule, well outward.

On the whole, then, Mr. Moore's form presents interesting features of relationship with both groups, the shape of the head, the peculiar palpi, the tentacles and the proboscis, the absence of a dental apparatus, and the pygidium leaning so far to the Syllids, whilst the structure of the foot and its bristles recall certain features observed in the Staurocephalids. More minute details of the structure of the foot and bristles by the author would be useful in enabling a more precise view of its relationships to be made.

* Fig. 2 *d*.

2. *On* Nevaya* whiteavesi, *a Form with certain Relationships to* Sclerocheilus, *Grube, from Canada.*

Dredged at Station 52, Gulf of St. Lawrence, Canada, 1873, by Dr. Whiteaves.

A fragment of the anterior region of a form (Pl. V. fig. 1) with a somewhat broad flattened body, a little tapered toward the front and rapidly narrowing behind the broad anterior region. The feet are deeply cut and have conspicuous bristles. Moreover, the second bristled segment has specially modified powerful golden bristles.

The head has anteriorly a somewhat slender prow (Pl. V. fig. 1 *a*), slightly blunt at the tip. From this a prominent and rather narrow median ridge (flattened vertically) passes backward to terminate in a small tentacle at the second bristled segment. The central region of the snout, indeed, is somewhat spindle-shaped when viewed from the dorsum, as a dilatation occurs in the middle, followed by the vertically flattened posterior portion. This condition recalls that in *Nerine*, especially as the lanceolate lateral processes resemble the branchiæ of that form. Part of the proboscis is extruded as a frilled organ. On each side of the median ridge anteriorly is an acutely lanceolate lamella (which may be branchial in function) pointing backward and outward, whilst from its inner border a tuft of slender glistening bristles (Pl. V. fig. 1 *d*) is directed upward, thus forming a remarkable arrangement in this region, and probably representing the dorsal division of the first pair of feet. Below is a small conical lamella, followed ventrally by a second of similar shape, a tuft of bristles projecting downward, outward, and forward in front and glistening with a brilliant metallic sheen. The ventral edge of this foot forms a long rounded elevation directed obliquely outward and forward from the median line and apparently clasping the buccal region. The ventral division carries a series of rather stout curved bristles (Pl. V. fig. 1 *b*), with a hook at the tip directed backward, but considerable differences exist amongst them, some being longer and more slender. At the posterior part of the cephalic median ridge another narrow lanceolate lamella projects on each side, the base being somewhat broader than that in front. In the preparation it slopes obliquely backward and outward. The arrangement of these lamellæ therefore recalls the condition in *Spiophanes*. Their relationship to the feet may not be quite free from doubt. The next

* Named after Nevay Park, on the Sidlaws, Forfarshire.

foot has in the ventral division four great flattened golden bristles with strong blunt points (Pl. V. fig. 1 *c*) attached to the massive setigerous region, a comparatively large lanceolate lamella occurring superiorly, whilst at the ventral edge is a small papilla. In the developing organs the points are, as usual, first formed. The dorsal bristles form a row superiorly, and consist of bristles similar to those in front, though shorter (Pl. V. fig. 1 *e*). They taper from the base to the tip, which is very attenuate, yet they make a somewhat rigid pencil or fan. Both they and the ventral bristles are encrusted with very small particles which obscure their minute structure.

The next segment is narrow and has a broad though narrow dorsal lamella which is lateral in position—that is, lies directly above the foot,—and its bristles are directed upward in front of it. No ventral bristles are present in the specimen.

The following three feet are similar, viz., each having a broad and vertically narrow dorsal lamella, with a bristle-tuft in front on the dorsum and a well-marked and increasingly massive ventral division, bearing a tuft of bristles the central series of which is often abruptly truncated below the tip. These bristles (Pl. V. fig. 1 *f*) are rather strong, straight, narrowed from the base distally, have a slight curvature below the tip, which is tapered to a fine point and feathered with a series of spikes. One of the stouter forms from this region is represented in fig. 1 *g*.

Behind the foregoing the dorsal lamella, which has the form of a vertical plate, moves further inward on the dorsum, and by and-by considerably diminishes in size, as also do the feet at the posterior end of the fragment, from which the proboscis projects posteriorly. The dorsal bristles of this region (Pl. V. fig. 1 *h*) have long shafts and finely tapered tips.

The head in this form differs from that in *Sclerocheilus* in the absence of the anterior processes and in the absence of eyes. No protrusible and ciliated nuchal organs are visible at the base of the snout as in *Sclerocheilus*. The presence of the caruncle with the small tentacle behind it also separates *Nevaya* from *Sclerocheilus*, whilst in certain features it approaches *Nerine*. The buccal segment in the latter is achætous. The second segment in *Sclerocheilus* bears dorsally and ventrally capillary bristles, and a little below ("au-dessus") the ventral papilla five or six powerful golden hooks, which De St. Joseph * thinks enable the animal to

* Ann. Sc. Nat. 8e sér. xvii. p. 106.

make its tunnel in shells. In *Nevaya* a fully developed foot with lamellæ and bristles occurs in front of that with the four great golden bristles inserted in the massive setigerous region. Moreover, no bifid or fork-like bristles occur in *Nevaya* so far as the single example shows. Both *Sclerocheilus* and *Nevaya* present a remarkable development of certain anterior ventral bristles which must in some way be connected with their dwellings, whether in tubes or burrows; yet the divergences in the position and structure of these organs in each case indicate noteworthy differences in function. In *Polydora* the great hook-like bristles occur on the fifth segment, whereas homologous forms are on the third foot of *Disoma*. De St. Joseph after a careful survey of the structure of *Sclerocheilus* concludes that it belongs to the Scalibregmidæ.

3. *On the British* Cirratulidæ.

Four species representing the Cirratulidæ are given in Dr. Johnston's 'Catalogue of Worms in the British Museum,' viz. *Cirratulus tentaculatus*, Montagu, *Cirratulus cirratus*, O. F. Müller (under the name of *C. borealis*[1]), *Aonis vittata*, Grube, and *Dodecaceria concharum*, Œrsted.

By De Quatrefages the Cirratulids were classified chiefly by the arrangement of their branchiæ, which either occurred throughout or were confined to the anterior segment; but subsequent authors took into consideration the structure of the bristles and hooks, as shown, for instance, by Langerhans, Levinsen, Claparède, and others. Thus two great divisions of the Cirratulids are made by De St. Joseph, viz.: (1) those devoid of large prehensile tentacles, and (2) those having such. Further, they may be grouped: (1) into those having capillary bristles in both divisions of the foot throughout, (2) those having only capillary bristles in the dorsal division and crotchets in a certain number of the ventral divisions, and (3) those having capillary bristles and crotchets in a certain number of both dorsal and ventral divisions. The majority of the British forms fall under the third group, such as *Cirratulus cirratus*, *C. tentaculatus*, *C. bioculatus*, *Dodecaceria concharum*, and *Chætozone*.

C. tentaculatus is everywhere distributed round our shores from Shetland to the Channel Islands, and is abundant under stones on muddy and sandy ground between tide-marks. Such muddy sand, indeed, is often furrowed by them and their trailing tentacles, which stretch as orange threads in every direction; and, besides, they are found in

various cracks and crevices of the rocks in the same region. The head (prostomium) is conical, and on each side, a short distance from the tip, an oblique depression slopes outward and backward, and from the point at which these converging grooves meet a ridge runs forward to the tip of the snout. Ventrally a deep groove leads backward to the mouth, which is bounded posteriorly by a thick transverse lip. In some specimens from Lochmaddy a little pigment occurs on the snout at the posterior and outer angle of the triangular anterior region, thus simulating eyes—indeed, the pigment is occasionally symmetrically arranged. In others from Guernsey and Herm a distinct band of ocular points passes from one side of the base of the snout to the other just in front of the constriction indicating the region. A variety with a blackish snout is met with at Herm, and Dr. Sowerby forwarded some in a similar condition from the estuary of the Orwell near Ipswich.

The body is from 6 to 9 inches in length, rounded on the dorsum, flattened ventrally, tapered anteriorly and more distinctly but gradually diminished posteriorly, where it ends in a pointed tail, the slit-like anus being dorsal, whilst in the mid-ventral line in some specimens is a small process like a rudimentary cirrus. Others show in lateral view a process above and a little in front of that just mentioned, and some present only a large terminal anus with a rim and no process. Such variations probably indicate injuries and reproduction. The number of segments ranges to 300 and upward in a large example. Vertical lines of dark pigment occur in the sulci at the segment-junctions—from the fourth segment backward for some distance.

On an elevated ridge which lies dorsally between the fifth and sixth bristled segments is a dense mass of tentacles on each side. The ridge is somewhat crescentic in front, straight behind, and the tentacles in the cluster number at least twenty. Each segment behind the foregoing has on each side its branchia situated behind and rather above the level of the upper bristle-tuft, and this throughout the whole anterior region, to the number of about one hundred in large examples. The branchiæ are more scattered in the middle and posterior regions, and cease altogether about the thirty-fifth or fortieth segment from the tip of the tail. After the seventh or eighth the bristled segments for a considerable distance are narrow, then become slightly wider, and again toward the tip of the tail are narrow. The remarkable spiral coils of the branchiæ constitute a feature of the species, and contact with sea-water is apparently less

congenial to the animal than with mud, which at least enables it to separate the long coiled filaments.

The peristomial segment is somewhat narrower than the two which follow, and each of which has various transverse creases or wrinkles. These are devoid of bristles, hooks, or other appendages. The first setigerous segment follows the foregoing and is broader than its successors. The foot is represented in the lateral region only by dorsal and ventral setigerous processes, which bear tufts of capillary bristles. Moreover, near the junction with the segment behind and nearly on a level with the upper bristles is a long coiled branchia. The capillary bristles have somewhat stout shafts and long, flattened, tapering tips, with a narrow border of spines directed distally. The four or five bristled segments which follow are broader than those next them, but all have the capillary bristles dorsally and ventrally. In the groove between the second and third bristled segment a second and smaller branchia occurs, the base arising a little above the level of the dorsal bristle-tuft. The same takes place in the groove between the third and fourth and between the fifth and sixth. The branchiæ and tentacles vary in size according to the degree of development, those in process of reproduction being small, whilst the older examples are thick. All are minutely ringed, probably from muscular fibres.

The strong hooks commence in the ventral series of the large examples from Plymouth at the sixty-second bristled segment, though they vary in this respect, some commencing at the forty-fifth, others at the sixtieth. The hooks are at first slender, but soon become robust, the neck curving backward and then forward at the tip, and probably they are the main agents in securing a firm hold of the burrow. Their appearance in the dorsal division is somewhat later, viz. between the ninety-first and ninety-fifth bristled segments. In both cases the foregoing figures differ from those of von Marenzeller and De St. Joseph. The former states that the first ventral hooks appear in *C. tentaculatus* between the thirty-third and forty-fifth segments, and the dorsal between the fortieth and forty-fourth; whereas in *Cirratulus chiajii* the ventral appear between the twenty-first and twenty-third and the dorsal between the fortieth and forty-fourth. The variation in regard to the appearance of these structures in British examples of *C. tentaculatus* would also, as De St. Joseph observes, lead to some doubt as to specific identity based on this feature.

An examination of two examples of *Cirratulus* (*Audouinia*) *filigerus* from Naples shows that in one the anterior tentacles

arise less definitely than in *C. tentaculatus*, it being difficult to say whether they are mainly opposite the sixth or the seventh bristles, whereas in the other they resemble more closely those of *C. tentaculatus* in transverse arrangement and they arise opposite the fifth pair of bristles. In both a branchia springs in front of the dorsal of the first series of bristles. The first ventral hooks occur on the thirtieth bristled segment on the right in the example first referred to, and the first dorsal hooks on the forty-first; whereas in the other specimen, with the groups of tentacles opposite the fifth bristles, the first ventral hook occurs on the nineteenth bristled segment and the first dorsal hook on the thirty-seventh. These hooks are slightly less curved toward the tip than those of the northern form, but otherwise are similar. The bristles are also proportionally larger.

A form approaching *Cirratulus filigerus*, D. Chiaje, from Malahide, Co. Dublin, obtained by the Royal Irish Academy's Expedition, is smaller than the foregoing species and presents certain differences. It is 3–4 inches in length, but of similar shape, the anus being dorsal, with a short cone beneath. Immediately behind and rather above the first bristled foot is a branchia, and so with the three following. On the dorsal sulcus between the fourth and fifth bristle-tufts is a group of four or five slender branchiæ. Behind the foregoing the branchiæ occur on each side and are sparsely distributed along the posterior region almost to the tip of the tail. The crotchets (hooks) appear in the ventral division about the twentieth bristled segment, whilst they occur in the dorsal division about the fortieth. Their curves are somewhat more pronounced than in *C. tentaculatus*, and in the posterior region the ventral are considerably larger and stronger than the dorsal.

The third form is *Cirratulus cirratus*, O. F. Müller, which is generally distributed round the shores of Britain between tide-marks. The head is broader than in *C. tentaculatus*, hoof-shaped, but with a slight notch in the centre, and with two well-marked bands of eyes sloping obliquely outward and backward. The body is 3 to 4 inches in length and has about 106 segments, more distinctly outlined than in *C. tentaculatus*, and their antero-posterior diameter is greater. It is rounded dorsally, somewhat flattened ventrally, where a deep groove runs from the first bristled segment backward to the tail, which ends in a point or papilla ventrally, with the

crenate anus above it. The colour varies from yellowish orange to deep madder-brown. Two achætous segments follow the prostomium. The fourth segment has a smaller sessile foot than the succeeding segments and bears two minute tufts of bristles which have the same structure as in *C. tentaculatus*. It also carries a series of proportionally large filiform branchial cirri arranged in two lateral tufts, each of seven or eight cirri of an orange colour, with contained blood-vessels. These coil and twist during the progress of the animal, and in proportion to the diameter of the body have a larger bulk than those of *C. tentaculatus*.

The following thirteen or fourteen segments bear branchial cirri, each arising above and slightly behind a line through the middle of the bristle-tuft. Some of these show a greater amount of blood than those in the dense anterior tufts. Here and there along the body a single cirrus springs from the dorsal arch considerably above the bristles, but the posterior region is devoid of them. On the whole, these cirri are much fewer in number than in *C. tentaculatus*, and do not show the remarkable spiral coils so characteristic of that species.

The feet differ from those of *C. tentaculatus* in so far as they are more prominent and the dorsal and ventral divisions considerably closer—indeed, in some, *e. g.* the first, the bases, fused with the body-wall, closely approach. The first twelve bristled segments have only the simple flattened tapering bristles, the points being extremely slender, and the ventral are distinguished from the dorsal by their shortness and in some by their proportionally broader tips. The dorsal slightly dilate from the base to the middle of the shaft, then taper gradually to the very fine hair-like tip. Parasitic structures, such as algæ, abound on them, and render them pinnate, besides winding round them. The front edge of each bristle is minutely and regularly spinous, the direction being distal. At the thirteenth foot a single crotchet appears on the ventral division. In structure the crotchets (hooks) dilate a little from the base to a point above the middle, where there is a slight forward curve, then a slight backward bend occurs, and again a forward curve to form the hook at the tip. This projects through a neatly rounded aperture in the cuticle, and is moderately acute in the uninjured forms. In the sixteenth foot three hooks are present, and four in the thirtieth. One or two bristles accompany the hooks. The crotchets commence in the dorsal division about the thirtieth foot, a slender sharp-pointed one appearing in the twenty-ninth, or perhaps earlier, along with the bristles, and they

continue to the posterior end, both divisions having a few slender tapering bristles, which are more conspicuous than in front. So far as observed, the hooks of the dorsal division posteriorly are slightly more slender and less curved than those in the ventral.

A small form (young?), dredged off Shetland by Dr. Gwyn Jeffreys in 1867, presents the peculiarity of having only two eyes, and the head shows less of a basal constriction than is usual in examples of *C. cirratus* of the same size. The complete tentacles of the fourth segment are of very great length, probably reaching in life beyond the tip of the tail, which has a ventral papilla similar to that of *C. cirratus*. The tenth foot has dorsally a long slender tuft of finely tapered bristles, whilst the ventral bristles are much shorter —the flattened tips being expanded like a "bellied" knife, and then tapered to a fine point. The hooks by-and-by appear in both ventral and dorsal divisions, and their shape corresponds with that of the ordinary examples of *C. cirratus*. De St. Joseph* found that in the young of *C. tentaculatus* of 12 mm. the crotchets appeared in the tenth segment; but the structure of the bristles and hooks of this form differ from those of that species, not to allude to the structure of the head. Keferstein's *Cirratulus bioculatus*† differs in the shortness of its tentacles, in the structure of the hooks, and in the nature of the caudal region, which has two cirri. Too much reliance, however, cannot be placed on the representations of the minute structure of the bristles at that period.

Dodecaceria concharum, Œst., is common under the roots of tangles (*Laminaria digitata*), especially when these have a crust of *Lithothamnion* beneath them; occasionally in sandstone, as at the West Rocks, St. Andrews.

In this the dull greenish head is more attenuated than the rest of the body, the anterior border being rounded, though capable of various changes of form. The colour is brownish red anteriorly, greenish yellow posteriorly, and streaked longitudinally with the red blood-vessel. Some have touches of orange. They dye spirit green. The mouth opens a little behind the tip inferiorly as a Y-shaped slit in which the action of the cilia is marked, and with a considerable amount of dark pigment on the lips. The body is about an inch in

* Ann. Sc. Nat. 8e sér. t. xvii. p. 50.

† Zeitschr. f. wiss. Zool. Bd. xii. p. 121, Taf. x. figs. 23–27.

length, slightly tapered toward the snout and distinctly diminished toward the tail and more or less rounded throughout. The segments are 60 or more, and when the body is extended the anterior region is nearly as narrow as the snout. The tentacles are 12 in number, six on each side, arise on the dorsal surface opposite each other, and the bases of the pairs approach quite as closely as in *Dodecaceria ater*. They commence on the anterior part of the second segment, the first pair being longer than the others. As a rule they are of a pale green colour, with darker pigment at the tip, but they may be dull orange. A coiled blood-vessel proceeds along the centre of each, and the edges of the tentacle are often crenated, and when extended frequently show a dilatation at the tip, but no cilia. When sickly the tentacles assume a dull brown hue.

The first seven bristled segments have on each side two fascicles of simple bristles which taper to very delicate tips. In the eighth segment the ventral division has a few of the peculiar bill-hook crotchets amongst the bristles, and at the tenth the latter only occur in the ventral series, whilst some show dorsally a few of the simple tapering bristles and about three stouter bristles, the tips of which have been abraded, so that an oblique surface remains. The typical crotchet or hook has a slightly curved shaft, which somewhat increases in diameter from the base to the distal third, then gently bends backward to the neck, where the dorsal line again has a backward curve, and then goes forward to the tip. The anterior curve, which at the neck is also slightly backward, is abruptly broken by a bold conical projection, from the apex of which the distal curve runs to the stout tip. It thus differs in all respects from the tip of the southern *Dodecaceria ater* of De Quatrefages.

In the posterior part of the body the dorsal setigerous cone bears a few of the long slender tapering bristles, and one or two stout hook-like bristles bevelled at the tip and representing a modified type of the ventral series, for they present no enlargement on the anterior face below the bevelled region. The ventral division likewise has a bristle or two of a shorter type than the dorsal, which are conspicuous in a lateral view from above, and one or two of the characteristic crotchets, the only peculiarities being their shortness and the more marked curve of the less robust hook at the tip. The conical projection at the anterior base of the curve of the tip is marked.

In a young example 3–4 mm. in length, procured along

with young *Arenicola*, the little boring *Sipunculus*, *Pholoë*, and swarms of *Polydora ciliata* at the East Rocks, St. Andrews, the body, in spirit, is rounded in front, but the posterior third is more or less flattened, as in *Heterocirrus*. The colour of the two regions also differs, that in front being pale greyish, whilst the posterior is brownish red. The bristled segments are about 35 in number. The snout is formed as in the adult, with the mouth considerably behind, and the tentacles and the branchiæ are well developed. The two rounded papillæ at the vent are more distinct than in the adult. The characteristic hooks show that whilst the flattened posterior region simulates that of *Heterocirrus ater*, the form is essentially different.

No feature in Guernsey and Herm is more interesting in the littoral region than the abundance of boring forms in the coating of *Lithothamnion* on the surface of the hard gneiss, especially at low water. Amongst them is the next form, viz. *Dodecaceria ater*, De Quatrefages (which is not a variety of *Dodecaceria concharum*, which also occurs in the fissures of the rocks in long galleries curved in various ways). Langerhans * and De St. Joseph consider this only a variety of *D. concharum*, but so marked a variety, especially in regard to the structure of the hooks, merits in the meantime special separation. It may be that Langerhans had not the present form before him, for his figure of the hooks of *D. concharum* is good. The head of this species is rather elongated, like that of *Phyllodoce*, slightly tapered and smoothly rounded in front, and with two dark patches of minute eyes in the median dorso-lateral region, the snout in front of these generally being pale in the preparations, whilst that behind is dark. The mouth opens ventrally a short distance behind the tip of the snout, as in other forms, and not at the tip as De Quatrefages observes.

The body is 1–2 inches long, rounded or slightly flattened in front, more distinctly flattened after the anterior third, and often forming a broad oar-like region posteriorly before abruptly narrowing toward the tip, which presents a papilla on each side of the vent. It is slightly tapered toward the snout and the segments throughout are distinctly marked, their antero-posterior diameter being larger in front than behind, though the first four or five bristled segments are narrow. The colour is of a very dark blackish green throughout, the tentacles being pale green, with a central

* Zeitschr. f. w. Zool. Bd. xxxiv. p. 96.

red streak (vessel). It tinges spirit green, giving out a dark green exudation like dark specimens of *Cirratulus*.

De Quatrefages thought that the buccal segment was in abeyance ("L'anneau buccal a presque entièrement disparu"), yet not only the mouth-parts, but the bases of the great tentacles are close to the peristomium. The large tentacles are prominent organs, with a deep groove on their ventral surface; and as the edges of these are crenated, they in all probability approach in function to those of *Polydora* and other Spionidæ. Above and behind the tentacles is a branchia, and, as a rule, three others follow, each on the dorsal arch of its segment, and with a diminishing distance transversely between the bases. They are of moderate length, and in some have a tendency to form curves and a few coils.

Behind the tentacles are indications of five segments, but whether the imperfect first of these should be regarded as an independent one may be an open question. The four following have dorsal and ventral bristles of a simple tapering kind, minutely serrated along the anterior edge. These and the next are all narrow segments, and differ in this respect from those which follow. The foot is represented by a dorsal and a ventral setigerous papilla, with a ridge between. The type of foot, however, changes at the seventh, where the characteristic crotchets occur dorsally and ventrally. On their first appearance these organs have a slight forward curve of the shaft as far as the distal third, where a backward curve takes place. The shaft shows only a slight dilatation from the base upward for a short distance, remaining nearly of the same diameter to the neck, where it bends backward and again forward at the tip (Pl. V. fig. 2 *a*). The latter in certain antero-posterior views presents a median rib and two lateral wing-like areas, but probably this appearance is due to the thicker tissue in the centre and the thinner and slightly expanded lateral regions. In lateral view the hollow of the distal hook appears to be scooped out like an old snuff-spoon, but there is no knob at the anterior base as in *D. concharum*. These hooks increase gradually in strength though not in length in both divisions of the foot posteriorly, and their number toward the tip of the tail diminishes, but they are of proportionally great size, and thus in contrast with those of *D. concharum*. Two occur in the dorsal and three in the ventral division just in front of the tail, but the number is variable. The alterations of the contour of the tips of the hooks would indicate that they have special functions in connexion with the tube, and

their gradual increase in length from before backward corroborates this view. In some, when seen antero-posteriorly, the tips are spatula-shaped, a slight constriction occurring at the neck. One or two capillary bristles, with a slight flattening of the tapered and serrated tip, accompany the dorsal hooks. Several procured at Guernsey and Herm in July and August had well-developed eggs. Moreover, an epitokous male more than 2 inches long occurred amongst the others. In this the anterior region of about twenty-two segments (exclusive of the head and six or seven segments) is modified, whilst the caudal of about thirty segments is not materially changed. The pigmented area of the eyes is perhaps a little larger, and the dorsal tuberosity of the head somewhat more prominent, whilst the tentacles and branchiæ are normal. The whole of the anterior and middle regions are enlarged and softer, and have long resplendent dorsal swimming-bristles which in length exceed the diameter of the body. They are smooth, simple, tapering bristles with very faint longitudinal lines, and of a pale yellow hue, best seen by transmitted light, and their tips are remarkably attenuate. The anterior dorsal bristles are little altered, but from the eighth to the thirty-first they form conspicuous tufts on each side. This bristled region, with the head, is probably thrown off and discharges the sexual elements, whilst the unchanged and flattened moiety of about thirty segments reproduces a head and anterior region. The fact that this example, which was not quite ripe, still occupied its tube in *Lithothamnion* would indicate that up to the period of "swarming" the oar-shaped posterior region and its series of powerful hooks would be of material service to the form, and, further, after the separation of the sexual region, if such is found to occur, the remnant would be ready for the emergencies of its life in the calcareous crusts and masses. The great size of the hooks or crotchets throughout, and especially in the posterior region, shows that the form is adult and that the shovel-shaped and abraded posterior hooks have been in constant use. In the dorsal division one or two of the tapering capillary bristles with the anterior edge of the tip serrated are present.

The great size of the hooks in *Dodecaceria ater* and their special structure at once attract attention, especially when contrasted with those of *D. concharum*.

A form (*Chætozone dunmanni*), which appears to be intermediate between *Cirratulus* and *Chætozone*, comes from

Dunmanus Bay. 11. 2. 92 in the collection of the Royal Irish Museum.

The snout forms a blunt cone, with slight lateral notches which may indicate sensory grooves, and the peristomial segment is devoid of bristles. The mouth opens ventrally as a large aperture, having a crescentic groove posteriorly and a median furrow between the two lateral lips anteriorly. From the peristomial segment the body gradually widens to the eighth or ninth bristled segment, and then rather abruptly dilates into an ovoid swelling including about ten segments, when it again contracts, such being doubtless due to the mode of preparation. The segments of the anterior region are distinctly marked and one-ringed, and the feet are represented by lateral ridges with dorsal and ventral setigerous processes and a minute flat intermediate papilla. Anteriorly the feet present, as at the sixth, a long dorsal tuft of capillary bristles and a shorter one ventrally. This arrangement continues toward the thirtieth foot, when a stouter series appear—at first simply modified ordinary bristles with a double curvature of the shaft and a finely tapered tip, the ventral series apparently preceding the dorsal. Finally, posteriorly both divisions have the elongated and characteristic hooks. These have long, straight, finely striated shafts, which at the upper part have a slight curve forward, then gently curve forward to the sharp tip. The striæ cease about the middle of the tip. They thus differ from the condition in *Chætozone* and approach that in *Cirratulus*.

A species (*Chætozone zetlandica*) dredged by Dr. Gwyn Jeffreys in 100 fathoms in St. Magnus Bay, Shetland, in July 1867, appears to differ from *Chætozone setosa*. It is a fragment about ½ an inch in length of the middle and posterior regions, including more than sixty bristled segments, and is distinguished from *C. setosa* by the flattened body, the more hirsute lateral regions, the button-shaped anus, and the absence of the differentiated posterior region so characteristic of the species just mentioned. The broad flattened body has very distinct segments, with setigerous papillæ projecting as conical eminences on each side. The posterior end seems to have been reproduced, about fifteen segments being thus added with the large button-shaped pygidium; but the general structure of the feet remains as in front, and it differs from the condition in *C. setosa*, in which the modification of the crotchets in the posterior region is characteristic.

The feet at the anterior end of the fragment present dorsally a few very long and finely tapered capillary bristles and a series of broad flattened bristles, curved and faintly striated and with tapered extremities. They represent the intermediate forms ushering in the anterior crotchets of *C. setosa*. The ventral division consists of a few shorter capillary bristles and a shorter series of the same curved, flattened, faintly striated bristles, with tapering tips as in the dorsal division. In front of the reproduced tail the dorsal division has a few long, tapering, capillary bristles, the main series, however, consisting of long, stiff, curved, and striated forms, with a nearly cylindrical shaft inserted in the tissues, a constriction being evident before passing through the skin, after which it curves forward, and ends in the long, flattened, curved, and tapering tip. The ventral division, again, has shorter bristles of the same kind as the foregoing, besides a series of stouter crotchets, which have flattened shafts inserted in the tissues and slightly narrowed curved tips tapering to a blunt point.

This form, therefore, appears to pertain to De St. Joseph's second series, viz., those with capillary bristles in the dorsal throughout and crotchets in a certain number of the ventral divisions of the feet, but the absence of reliable figures makes its relationship to known forms uncertain.

4. *On the* Cirratulidæ *dredged by H.M.S. 'Porcupine' in* 1869 *and* 1870.

A Cirratulid (*Cirratulus tessellatus*) dredged in the 'Porcupine' Expedition of 1870 at Station 50, off the Algerine coast in 7–51 fathoms, appears to differ from any described. It was probably procured by the tangles attached to the dredge. The head forms a short cone with a large lateral eye on each side just in front of the posterior constriction and the collar of the next segment, which, however, is connected dorsally with the head by a bridge. The mouth opens ventrally as a comparatively small aperture in the snout in front of the collar. The body is about 2 inches in length and fusiform in outline, the greatest diameter occurring at the anterior third, from which it tapers to the snout and more gently to the tail. It is rounded dorsally, flattened ventrally, though posteriorly it is somewhat compressed on both surfaces. The segments are narrow and numerous. Anteriorly the rings are slightly tessellated, after the manner of *Scelibregma*, though to a less extent, and this condition probably occurs throughout in the fresh or well-preserved

animal. A median streak occupies the centre of the dorsum and another the mid-ventral line. Apparently three achætous segments follow the head, the third and broadest being tessellated or crenate ventrally as well as dorsally, the latter surface being so broad as to reach the area of the next segment toward the middle line, the lateral region being occupied by the elongated scar for the tentacles, only traces of which are present in the examples. The outer edge of each tentacular area abuts on the prominence of the dorsal division of the first bristled foot, which occupies a dorso-lateral position, the dorsal divisions of the succeeding feet forming a well-marked oblique ridge on each side and causing the body to appear as if sheathed in the anterior region (snout and achætous segments). This arrangement is due to the greater distance between the dorsal and ventral divisions of the first feet, the oblique region including about fifteen feet. Thereafter the dorsal and ventral divisions approach more closely, the space between them, however, remaining distinct to the posterior end. Each division of the foot carries a tuft of long, pale golden, capillary bristles (Pl. VI. fig. 3 issuing from a distinct setigerous process, and no change in the structure of these organs occurs from front to rear. The dorsal bristles, as a rule, are longer than the ventral and are curved outward and backward, the length being less than half the diameter of the body anteriorly. Each consists of a long basal region or shaft slightly narrowed proximally, remaining of the same diameter for some distance, and then gradually tapering to a fine point. Posteriorly one of the dorsal bristles in each tuft is considerably larger than the rest, the tip stretching outward as a long delicate hair. The tips of all, indeed, in this region are very fine. The ventral bristles are shorter and slightly broader, but also have delicately tapered tips. The ventral setigerous processes and tufts are really ventral in position, for in the preparations they are visible only in ventral and lateral views.

The structure of the bristles of this form distinguishes it from the *Chætozone macrophthalma* of Langerhans *, and, moreover, the skin of the species from Madeira is smooth. The *Heterocirrus marioni* of De St. Joseph † from Dinard has no crotchets, capillary bristles occurring throughout both divisions, but the ventral bristle is flattened at the tip and with a hair-like termination.

* Zeitschr. f. wiss. Zool. Bd. xxxiv. p 98, Taf. iv. fig 10.
† Ann. Sc. Nat. 8e sér. t. xvii. p. 56, pl. iii. figs. 62-64.

A *Heterocirrus* (*Heterocirrus gravieri*, sp. n.) dredged at Station 29 off Cadiz, to the west of the Straits of Gibraltar, in 227 fathoms, in the 'Porcupine' Expedition of 1870, appears to differ from any described. At this station, according to Dr. Gwyn Jeffreys, there was an admixture of northern and southern forms. The head is pointed in front and constricted posteriorly, so that from the dorsum it is almost cordate in outline. The mouth, as in allied forms, opens a little behind the tip of the snout. The body is about an inch in length, somewhat narrow and elongate, and slightly flattened from above downward throughout, the tail not being wider than the preceding region, and terminating in a pointed extremity with the anus above it. The colour in spirit is pale brown, darker at the tip of the tail. Anteriorly the dorsal bristles (Pl. VI. fig. 3) are longer than in allied forms with the exception of *Chætozone*, but they become shorter posteriorly. A pair of tentacles occurs in front and a pair of branchiæ on each side behind it. The tentacle is darker, longer, and thicker than the others, though apparently not differing in external structure. It arises immediately behind the head and may be the homologue of the grooved tentacle, *e. g.*, of *Dodecaceria ater*. A branchia springs just above it.

The first foot has a distinct dorsal setigerous papilla and a long tuft of simple tapering bristles which nearly equal the diameter of the body. The ventral division has a similar though shorter tuft. This arrangement continues for some distance and then the characteristic hooks appear in the ventral division. These (Pl. V. fig. 3 *a*) are comparatively long and slender, with a slight forward curve. The shaft dilates a little from the base to the distal third, where a slight backward curve and a diminution take place to the neck. The tip has an enlargement beyond the neck, then the posterior curve, in lateral view, forms a segment of a large circle and again points forward at the hooked tip. The anterior curve again is chiefly backward and then forward at the terminal hook. The length of the distal region in this hook is characteristic. A few bristles accompany the ventral hooks to the posterior end. By-and-by between the twentieth and thirtieth foot the hooks appear also in the dorsal division, one or two of these organs accompanying the bristles, which continue to the posterior end of the annelid.

This species inhabits a firm though thin calcareous tube strengthened externally by grains of sand, foraminifera, and fragments of shells. The interior of the tube is perfectly

smooth. At one point the tube had been broken and repaired, but an angle on each side indicates the union. The tube had also been fractured in capture, and the annelid had doubled itself into the largest fragment—the head and tentacles being completely protected, but the tip of the tail protruded.

This form has certain resemblances to the *Heterocirrus caput esocis* of De St. Joseph, but the absence of eyes and the structure of the anus and of the hooks indicate divergences.

Chætozone A.

A fragmentary form without snout or terminal region was dredged on the 3rd September, in the 'Porcupine' Expedition of 1870, in the Bay of Tunis. In all probability it adhered to the "tangles," which the naturalists then used, after the time-honoured practice of the coral-fishermen of the Mediterranean. The absence of the head and posterior region renders diagnosis and description imperfect, but externally it differs in certain respects from the northern *Chætozone setosa*. Thus the body is more rounded, presents no dorsal groove in the preparation, and the ventral groove is slightly marked, whereas both are usually distinct in *C. setosa*. The lateral bristles are much shorter, and though the specimen is a small one, the basal deep brown hue and the great breadth of the yellow tips, as at the tenth foot (for so all is termed beyond the bend at the end of the shaft), are diagnostic (Pl. VI. fig. 4). The broad terminal blade tapers to a long and fine point which is usually curved. Moreover, whilst they are somewhat brittle, they do not exhibit that proneness to split from the edge downward and backward as commonly seen in *C. setosa*. Accompanying the foregoing are a few narrow forms (Pl. VI. fig. 4 *a*). Although proportionally the crotchets should have been present in the portion of the posterior region attached, only bristles exist. The inserted basal region or shaft of the bristle is deep brown, curved and dilated from the somewhat narrow end upward, and is striated.

Two fragments of the anterior region of a *Chætozone* which does not appear to differ from *C. setosa*, Malmgren, were procured probably by the tangles in Bono Bay, on the coast of Algiers, in the 'Porcupine' Expedition of 1870. As no crotchets are present, a certain amount of doubt remains, especially as the bristles at the end of one fragment are

unusually long. The bristles are proportionally longer than in *C. setosa*, and their bases have a deep brown tinge.

Besides the foregoing, two fragmentary examples (×) apparently agreeing with *C. setosa* occur, but as only the anterior region is present in each, there is doubt. The snout in one is acutely conical, whereas in the other it is retracted into a blunt cone, and reddish-brown pigment marks the origin of each capillary bristle-bundle, both dorsally and ventrally.

Chætozone carpenteri *.

The anterior region of a form presenting characteristic features was dredged in the 'Porcupine' Expedition of 1870 in Bono Bay, on the coast of Algiers, in 25 fathoms. It also appeared off Cape Guardia, off Cape Finisterre, in the same Expedition. It is a somewhat larger and more rounded form and does not show the dorsal and ventral grooves of *C. setosa*. The snout (Pl. VI. fig. 5) is somewhat longer than in the common form and in one has a dark speck on each side at the posterior border of the prostomium, and these specks are best seen on the ventral surface, or from the front; the mouth opens on the ventral surface, a short distance behind them. The body has the usual fusiform shape, its largest diameter being about the anterior third. The bristles, which stretch from each side with an upward and backward curve, are proportionally longer than in *C. setosa*. They commence as considerable tufts in the first foot, the slightly yellow shaft being constricted about the level of the skin, and then the tip flattens out more in the shorter and less in the long forms, and finally tapers to a long hair-like curved extremity. The broader blades (Pl. VI. fig. 5 *a*) readily split in this region so as to make a brush-like appearance, the direction being downward and backward. The most characteristic feature, however, is the appearance about the tenth foot of crotchets in the dorsal and then in the ventral division (Pl. VI. fig. 5 *b*). In this foot (tenth) the bristles have attained great length, the dorsal being considerably longer than the ventral, the slight constriction below the long flattened blade being noteworthy, as well as the length of the attenuate tip. Those injured show the brush-like fractures already alluded to. The shorter forms have stouter shafts, and by a little modification the crotchets (Pl. VI. fig. 5 *c*), which are still

* Named after the late Dr. W. B. Carpenter.

thicker, are developed. The shaft dilates in its progress upward, then gradually diminishes to the slightly curved tip, which is rather blunt. At the twentieth bristled foot the bristles are still longer but more slender, and two crotchets are present ventrally, whilst dorsally there are four considerably stouter, and the bristles are very long, stretching far beyond the body. A considerable number of bristles occur ventrally between the hooks, whilst there are three dorsally. At the fortieth foot (Pl. VI. fig. 5 *d*) four large crotchets are present in each division—now closely approximated, the ventral being shaped like a scapel set in its handle, with a slight constriction and bend at the end of the handle : both shaft and tip are longitudinally striated. The dorsal crotchets still are the stronger (Pl. VI. fig. 5 *e*) and the tip (or blade) is more distinctly curved. Four long bristles occur between the third and fourth (that is, toward the ventral edge) ; whilst ventrally two bristles lie between the first and second and two between the second and third.

These posterior crotchets differ from those of *C. setosa* in their great size and in the absence of longer intermediate forms, as well as in their occurrence anteriorly.

Chætozone Z.

A fragment of the posterior end of a form not hitherto seen, and having the shape of a gradually widening and spathulate tail with the broad end posteriorly. The posterior border is bluntly rounded, with a median ridge dorsally and ventrally, the former curving downward to terminate in the ventral anus which has a peak anteriorly. The region in front of the broad tail is considerably narrower, the dorsal surface being rounded and the ventral flattened. The segments are numerous and narrow, and have dorsal and ventral tufts of slender capillary bristles (Pl. VI. fig. 6 *a*) of a pale yellow colour and nearly straight. It was procurved in the 'Porcupine' Expedition of 1870, no locality being given.

A peculiar form, which may temporarily be termed *Cirratulispio*, was dredged in the 'Porcupine' Expedition of 1869 in 378 fathoms in sticky mud off the coast of Ireland. The mud contained fragments of foraminifera, coccoliths, and sandy débris.

The head (Pl. VI. fig. 7) is bluntly conical and the sides of the cone slightly hollowed. A pair of slender tentacles pass from the bristled segment immediately behind, and therefore apparently posterior to the buccal ring.

The body is filiform and elongated, probably 2–3 inches in length, apparently tubicolous, and it is imperfect posteriorly; but at least two regions are recognizable—namely, the anterior with nine pairs of well-marked pale golden bristles, and the succeeding division.

The first region agrees with the Chætopterids in the number of the segments (nine), and each foot has a dorsal and a ventral tuft of moderately long capillary, pale golden bristles (Pl. VII. fig. 7 *a*) which have a slight convergent curve—that is, the dorsal bending downward and the ventral upward. Both arise close together in the tissues, then slant from each other so that a flat cone in the middle of the foot lies between them. The dorsal tuft is considerably longer than the ventral, but the structure of the bristles is the same in both. Each bristle has a long cylindrical shaft not differentiated from the tip, and gradually tapering to a fine point from its middle, though in the shorter ventral forms there are differences in this respect.

No special differentiation separates the first region of the body from that which follows, and therein it differs from the Chætopterids; but the first segment of the succeeding region is three times broader (antero-posteriorly) than those in front, and its bristles are shorter and structurally different, whilst each of the two divisions carries a continuous row of stout curved crotchets without the differentiation between shaft and tip as observed in *Chætozone* (Pl. VII. fig. 7 *b* representing one from the tenth foot). Dorsally are two smooth capillary bristles, followed by five or six crotchets with the tips produced into slender processes, and then a series of the stout curved crotchets with slightly tapered tips ending in a stout though more or less pointed tip. The arrangement of these crotchets recalls the condition in *Chætozone setosa*, bristles being also interposed between the crotchets in the rows.

5. *On the* Cirratulidæ *dredged in the Gulf of St. Lawrence, Canada, by Dr. Whiteaves.*

Chætozone I.

A fragment of a *Chætozone* (?), apparently the posterior end of a large form, was dredged at Station A. 6, 1872, by Dr. Whiteaves. The total length is about an inch and a quarter. The segments are distinct though narrow throughout, and the body is somewhat dilated in front of the tail, and then gently tapers to the terminal anus, below which a process with a median groove projects posteriorly. The

body is rounded dorsally, slightly flattened ventrally, and the latter surface has a median groove. Both dorsal and ventral bristles (Pl. VII. fig. 8) are throughout capillary, and little difference exists between the most anterior and those at the tip of the tail. This, therefore, belongs to the first series of De St. Joseph, viz., those with capillary bristles throughout.

Chætozone setosa, var. *canadensis*. Stations 32–34—1873.

In this form, which has a general resemblance to *C. setosa*, though the body is more flattened posteriorly, the anterior bristles differ from those of *C. setosa*, for example at the tenth foot in having a distinct curve at the end of the shaft, and the long tip widens into a flat blade (Pl. VII. fig. 9), which then tapers to a fine tip; the whole, however, is considerably shorter than in the typical *C. setosa*. The general arrangement of the posterior hooks resembles that of *C. setosa*, though the crotchets (Pl. VII. fig. 9 *a*) are considerably larger and similarly alternate with a long capillary bristle (Pl. VII. fig. 9 *b*). It would be difficult to draw a specific distinction, however, from mere size.

Chætozone whiteavesi.

Dredged in the Gulf of St. Lawrence, Canada, by Dr. Whiteaves at Station A. 6 in 1872.

This species has much of the appearance anteriorly of *Chætozone setosa*, the snout being acutely pointed, and the tentacles and branchiæ being similar. The body is rounded dorsally in front, then is somewhat flattened, and again is rounded toward the tail, which is only a little tapered, and has a terminal anus with two small rounded papillæ ventrally. The ventral surface of the body is marked by a median groove from end to end, whilst the sides are flanked by tufts of long capillary bristles from the front to the middle of the body, and by shorter capillary bristles from the middle to the tip of the tail. This arrangement at once differentiates the species from *C. setosa* and allied forms, for their crotchets are conspicuous posteriorly. The gut shows through the integumentary layers in the region behind the middle—especially dorsally—the colour being dull pink.

The bristles throughout are capillary, the dorsal in front (Pl. VII. fig. 10) being considerably longer than the ventral and stronger than those in the succeeding region. Both dorsal and ventral tufts are shorter in the middle of the body, and the disproportion between dorsal and ventral is less marked, whilst posteriorly they are almost equal.

6. *On the* Cirratulidæ *dredged in Norway by Canon Norman, D.C.L., F.R.S.*

The northern form, *Chætozone setosa*, was first found in Finmark by Malmgren and in Sweden by Lovén, and it is abundant in the Fjords of Norway, where it was dredged by Canon Norman. The head is acutely pointed and somewhat triangular, with the mouth on the ventral surface a short distance from the tip. The body is about an inch in length, elongate-fusiform, tapering a little anteriorly and more gradually and distinctly posteriorly, where it terminates in a pointed extremity with the anus at the tip, which varies in acuteness according to the condition of regeneration, some being rather blunt after recent loss of segments. The thickest part of the body is about the end of the anterior third. It is more or less rounded throughout, with a tendency, however, to dorsal and ventral flattening. The segments number 70–90, and are narrow in front, but more evident posteriorly from the increased antero-posterior diameter. The surface is greyish in the preparations and is iridescent.

The long tentacles arise on the dorso-lateral region immediately behind the head, and seem to be rarely present in examples caught by the dredge. They have the ventral and probably ciliated groove of other forms.

The branchiæ occur in pairs, one on each side, probably from fourteen to twenty in succession, and then at intervals to the posterior third. They are slender filaments, those in front being long and sinuous. The first bristled foot occurs behind the tentacles and has a dorsal and a ventral tuft of pale golden capillary bristles, with a cylindrical shaft generally imbedded in the tissues, and a broader flattened serrated tip which tapers to a fine point. Little difference exists in the anterior region between the lengths of the dorsal and the ventral bristles, but after the twentieth, or thereabout, the dorsal elongate to about the diameter of the body, forming glistening tufts usually carried transversely in the preparations. Toward the posterior region stout, short, crotchet-like forms appear amongst the long bristles in the ventral and then in the dorsal division. They are more slender in the dorsal than in the ventral, and the dorsal bristles are fewer in number and more attenuate, only a brief flattened part occurring beyond the skin, the rest being hair-like. Moreover, the ventral bristles present intermediate forms, the shafts being three times the diameter of the ordinary

bristles, then a slight constriction takes place at the level of the cuticle, the tip being broad and more or less striated, but terminating in a long hair-like process. The perfect crotchet or hook is best seen in the posterior region of about fifteen segments, the shaft dilating a little from the soft base upward, then narrows about the level of the skin, from which a noticeable forward bend occurs, the long stout tip ending in a blunt point. The whole organ is striated to the point and somewhat resembles a miniature scalpel which has a curve backward (Pl. VII. fig. 11). The direction of these crotchets is at first slightly backward, but by-and-by they project transversely outward, and in four or five of the terminal segments they are directed forward—doubtless in connexion with their functions in mud or sandy mud.

Cirratulus norvegicus ?

A form dredged off Dröbak, Christiania Fjord, in 30–100 fathoms, in 1879, somewhat resembles *Cirratulus tessellatus* in so far as the dorsal divisions of the anterior feet approach each other dorsally, and in some are raised, so that the spaces between the lateral lines at the base of the feet are narrow in front and gradually widen in their course backward. Moreover, a considerable amount of dark pigment characterizes the anterior dorsal region and also occurs along the posterior lip of the gaping mouth.

The head has the form of a small blunt cone, sometimes constricted posteriorly, and when the button-shaped proboscis is extruded, as in the majority of the specimens, it projects upward and forward, or, in complete extrusion, upward.

The body is probably between 1 and 2 inches in length, flattened anteriorly, and somewhat rounded posteriorly. It is tapered rather abruptly anteriorly, but does not appear to be much tapered posteriorly, only a slight diminution taking place in the preparation; but such may be an incomplete specimen. It terminates posteriorly in a pouting button-shaped vent, which is produced ventrally into a process with a median fissure and a fillet on each side of it (Pl. VII. fig. 12). The ventral surface is flattened, sometimes with a median ridge and two lateral elevations, though in a few neither is visible. The buccal and two achætous segments follow the head, and in one example each has a dorso-lateral frill, it may be from imperfect preservation. Every example presents two short lappets (or, it may be, the bases of tentacles) interposed between the converging lateral lines of the feet nearly opposite the first bristle-bundles. A series of long

slender branchiæ project from the dorsal edge of more than twenty of the anterior feet, and traces appeared in some considerably behind these. The anterior segments are closely arranged, but posteriorly they are a little less so, and the number is probably from seventy to one hundred, though no specimen is complete.

Some had well-developed ova in July.

The structure of the feet throughout is the same, viz., a dorsal and a ventral setigerous process, each having a tuft of translucent pale yellow capillary bristles (Pl. VII. fig. 12 *a*), the tips being slightly flattened at the somewhat narrow base, and tapering to delicate hair-like extremities. The dorsal are the longer, and they increase in length toward the middle of the body, and remain of considerable length posteriorly, where the distinction between the more slender and longer dorsal and the shorter and proportionally broader ventral is maintained. A curious series of coiled tubes (?) occurs posteriorly.

EXPLANATION OF THE PLATES.

Plate V.

Fig. 1. View of *Nevaya whiteavesi* from the dorsum. The proboscis projects posteriorly from the ruptured end. Enlarged.
Fig. 1 *a*. Head and anterior region of the foregoing, still more enlarged.
Fig. 1 *b*. Strong hooked bristle of first foot. × Zeiss oc. 4, obj. A.
Fig. 1 *c*. Powerful hook of the second foot. × Zeiss oc. 4, obj. A+1 in. draw-tube.
Fig. 1 *d*. One of the first dorsal bristles. × Zeiss oc. 4, obj. D.
Fig. 1 *e*. Dorsal bristle of the second foot. × Zeiss oc. 4, obj. D.
Fig. 1 *f*. Bristle with curved and serrated tip from the ventral division of the fourth foot. × Zeiss oc. 4, obj. D.
Fig. 1 *g*. Stouter serrated bristle from the same region. × as above.
Fig. 1 *h*. Posterior dorsal bristle. × as before.
Fig. 2. Bristle of *Cirratulus tessellatus*. × Zeiss oc. 4, obj. D.
Fig. 3 *a*. Anterior hook of the foregoing. × Zeiss oc. 4, obj. D+1 in. draw-tube.

Plate VI.

Fig. 3. Simple anterior bristle of *Heterocirrus gravieri*, with minutely serrated anterior edge. × Zeiss oc. 4, obj. D+full draw-tube.
Fig. 4. Bristle of *Chætozone* A, showing entire outline. × Zeiss oc. 2, obj. D reduced.
Fig. 4 *a*. Tip of one of the foregoing of less breadth. × Zeiss oc. 4, obj. D, full draw-tube.
Fig. 5. Head and anterior region of *Chætozone carpenteri*. Enlarged.
Fig. 5 *a*. Bristle of the first foot of the foregoing. × Zeiss oc. 2, obj. D, full draw-tube.
Fig. 5 *b*. Tenth foot (dorsal division) of *Chætozone carpenteri*. Enlarged.

Fig. 5 *c*. Crotchet or hook of the foregoing. × Zeiss oc. 2, obj. D.
Fig. 5 *d*. Fortieth foot of the same. Enlarged.
Fig. 5 *e*. Dorsal crotchet of the fortieth foot. × Zeiss oc. 2, obj. D.
Fig. 6 *a*. Bristle of *Chætozone* Z. × Zeiss oc. 4, obj. D.
Fig. 7. Head and anterior region of *Cirratulispio*. Enlarged.

PLATE VII.

Fig. 7 *a*. Bristle from the seventh foot of *Cirratulispio*. × Zeiss oc. 4 obj. D, with full draw-tube.
Fig. 7 *b*. Crotchet from the first segment of the second region of the foregoing. × Zeiss oc. 4, obj. D.
Fig. 8. Bristle of *Chætozone* L., Canada. × Zeiss oc. 4, obj. D.
Fig. 9. Anterior bristle of *Chætozone setosa*, var. *canadensis*, from the tenth foot. × Zeiss oc. 4, obj. D.
Fig. 9 *a*. Posterior hook (crotchet) of the same. × as above.
Fig. 9 *b*. Capillary bristle alternating with crotchets. × as above.
Fig. 10. Bristles of *Chætozone whiteavesi*. × Zeiss oc. 4, obj. D.
Fig. 11. Hook of *Chætozone setosa*, var., from Norway. × Zeiss oc. 4, obj. D.
Fig. 12. Tip of tail of *Cirratulus norvegicus*, unfortunately from a specimen not quite complete.
Fig. 12 *a*. Bristles of the foregoing. × as above.

XVII.—*New Species of Heterocera from Costa Rica.*—V.

By W. SCHAUS, F.Z.S.

Syntomidæ.

Isanthrene monticola, sp. n.

Antennæ with the shaft black on basal half and at tips, otherwise white. Body ochreous; palpi tipped with black; black spots on tegulæ, five on thorax; black line on shoulders; dorsal and lateral black spots on basal segment of abdomen, followed by black intersegmental spots on other segments. Wings hyaline, the margins ochreous. Fore wings: the veins ochreous, partly irrorated with black; black streaks at base of costal and subcostal veins; apex and tornus more broadly ochreous, inwardly edged with black. Hind wings: the veins and inner margin finely black.

Expanse 34 mm.

Hab. El Sitio.

Sarosa mora, sp. n.

Antennæ black tipped with rufous. Body black; some blue on frons; whitish-yellow spots on tegulæ outwardly

edged with bright metallic blue; a dorsal whitish-yellow band at base of abdomen, extending laterally behind. Abdomen with two rows of metallic-blue spots above and a row of sublateral spots; a white band below beyond base; legs black spotted with blue; tarsi ochreous. Wings hyaline. Fore wings faintly tinged with brown; veins, terminal dashes between veins, outer half of inner margin, and the outer margin black; base of inner margin and costal margin reddish brown; the discocellular reddish brown; some bright blue metallic scales at base. Hind wings: the veins, outer margin narrowly, and a broader space at anal angle black.

Expanse 34 mm.

Hab. El Sitio, Sixola.

Loxophlebia egregia, sp. n.

Palpi and head black; frons white; a white spot on vertex. Body red; thorax medially black; abdomen dorsally black on three basal segments; last segment and anus black; coxæ roseate buff; legs outwardly black, inwardly roseate buff. Wings hyaline; veins and margins narrowly black, wider at apices and tornus; base of fore wings and inner margins of hind wings red.

Expanse 21 mm.

Hab. Guapiles.

Mesothen temperata, sp. n.

Antennæ black, irrorated with white before tip. Palpi and head black; the frons white. Collar black in front, yellow behind. Thorax black; patagia deep yellow. Abdomen deep yellow; a black dorsal spot on first segment; a large similar dorsal space on following three segments extending laterally, and shot with steel-blue; the last two segments black, shot with steel-blue; a lateral black band on segments 2–4; ventral valve black except at base. Thorax below yellow. Legs: femora yellow; fore and hind tibiæ and tarsi black; hind tibia and tarsi yellow, only black at joints. Wings hyaline: the veins and margins black. Fore wings: the tornus and apex broadly black; a yellow streak medially on subcostal; a black spot on discocellular. Hind wings: the costal margin medially yellow.

Expanse 29 mm.

Hab. Juan Vinas.

Mesothen montana, sp. n.

Antennæ black. Head, collar, and thorax dark brown. Abdomen yellow; two rows of black dorsal spots on segments 2–6. Thorax below dark brown. Legs yellow; tarsi and part of hind tibiæ dark brown. Wings hyaline; the veins and margins narrowly dark brown, widening at apices; the discocellular of fore wings broadly blackish brown.

Expanse 39 mm.

Hab. Volcano Poas, 7000 ft.

Mesothen ethela, sp. n.

Palpi brown. Head black; frons white; small white spots behind antennæ. Collar and thorax dark brown, patagia black; large white spots on shoulders. Abdomen bright yellow, terminally black. Fore legs brown, coxæ white; hind legs outwardly black, inwardly buff. Wings hyaline, the veins and margins brown. Fore wings: apex and tornus more broadly brown, a small white spot at base of subcostal vein.

Expanse 28 mm.

Hab. Sixola.

Chrostosoma sitiona, sp. n.

Palpi, antennæ, and head black. Body yellow, the abdomen terminally black. Legs black, coxæ yellow. Wings hyaline; veins and inner margins finely black; apices very broadly black. Fore wings: the costal and outer margin rather broadly black; some yellow at base.

Expanse 29 mm.

Hab. El Sitio.

Cosmosoma nobilis, sp. n.

Antennæ, palpi, and head black; the frons metallic blue. Collar black with metallic-blue spots. Thorax black; some dorsal blue scales; a large opalescent blue spot on metathorax. Abdomen black; the segments posteriorly narrowly yellow; lateral transverse blue lines and sublateral blue spot; the last two segments metallic blue; two opalescent spots dorsally on first segment. Legs black irrorated with blue. The wings hyaline; veins and margins black, broadly at apices. Fore wings: a large black spot at end of cell; the base of costal margin and below cell with metallic-blue scales. Fore wings below: the basal third of costa streaked

with blue; some blue scales below cell at base. Hind wings below: the basal half of costal margin streaked with blue extending into cell.

Expanse 44 millim.

Hab. Juan Vinas.

Cosmosoma guapila, sp. n.

Antennæ and body black; palpi irrorated with white in front; metallic-blue spots on frons, vertex, collar, shoulders, and patagia anteriorly; paired spots on metathorax; dorsal and lateral blue spots on abdomen; transverse creamy-buff streak on third and fourth segments; anal segment orange-red; ventral valve banded with white; coxæ white; legs black, irrorated with metallic blue at joints; fore tibia streaked with white; hind tarsi partly whitish. Wings pale brownish hyaline; the veins and margins finely black; metallic-blue spots at base of fore wings. Hind wings: the basal half of costa and cell creamy buff; the inner margin broadly black.

Expanse 29 mm.

Hab. Guapiles.

Allied to *C. beatrix*, Dr., but much smaller.

Cosmosoma cinctuta, sp. n.

♀. Antennæ and palpi black. Head black, irrorated with blue on vertex; some white on frons. Tegulæ and patagia orange edged with black. Thorax black, irrorated with blue behind. Abdomen: basal segment orange, divided by a black dorsal line, ochreous black with two rows of blue spots, and dorsal blue spots obsolescent on segments 3 and 4; two small orange spots on fourth segment. Legs orange, partly streaked with black. Wings hyaline, the veins and margins black. Fore wings: the apex more broadly black; an orange streak on costa from base to black apical portion; some orange on base of inner margin. Hind wings: some orange at base of inner margin.

Expanse 30 mm.

Hab. Juan Vinas.

Allied to *C. saron*, Druce.

Cosmosoma rubritarsis, sp. n.

Antennæ black, tipped with white. Palpi, head, and thorax black; some dark blue on frons and vertex. Abdomen above crimson; a dorsal black line expanding on basal

segment; last two segments black with small blue spots; three triangular black lateral spots, partly irrorated with blue; underneath black. Coxæ and legs red, the latter outwardly streaked with black; tarsi red. Wings hyaline, the veins and margins black. Fore wings: the apex more broadly black; a narrow black spot on discocellular.

Expanse 38 mm.

Hab. Guapiles.

Cosmosoma colona, sp. n.

Antennæ black, irrorated with white at tips. Body black: frons, tegulæ, and patagia shaded with dark metallic blue. Abdomen with transverse dark blue lines interrupted dorsally; the last two segments vermilion-red; a lateral white spot on first segment; white spots at base of mid and hind coxæ. Legs streaked with dark blue. Wings hyaline, the veins and margins black. Fore wings: the apex broadly black; a black streak on discocellular. Hind wings: the inner margin broadly black.

Expanse 33 mm.

Hab. Sixola.

Cosmosoma angustimargo, sp. n.

Antennæ, head, collar, thorax, and last two segments of abdomen black; abdomen otherwise bright yellow; frons laterally white; a white spot laterally behind eyes; a few white scales on vertex. Legs dark brown; fore coxæ streaked with white. Wings hyaline, the veins and margins narrowly black, widening at apices. Fore wing: the discocellular angled, finely black; a white spot at base, followed by a similar white spot.

Expanse, ♂ 29 mm.

Expanse, ♀ 37 mm.

Hab. Juan Vinas.

Cosmosoma impudica, sp. n.

Antennæ, pectus, legs, palpi, and head black; two white spots on frons. Collar, thorax, and abdomen bright yellow. Wings hyaline, the veins and margins black. Fore wings: the base yellow; an inwardly angled black spot on discocellular; the terminal band wider at apex and at tornus. Hind wing: the inner margin and apex more broadly black.

Expanse 37 mm.

Hab. Juan Vinas, El Sitio.

Differs from *C. pudica*, Druce, in having no black terminally on abdomen.

Holophœa gentilicia, sp. n.

♂. Antennæ and abdomen above black, some blue on anal segment. Frons dark brown, irrorated with metallic blue. Vertex, collar, and thorax red. Body below and legs black-brown. Fore wings dark brown; the base of costa and below cell red. Hind wings similar dark brown; a blackish area below cell.

Expanse 30 mm.

The female has less red at base of fore wings, and the last three segments of abdomen are blue-black.

Expanse 31 mm.

Hab. Juan Vinas, Tuis.

Psilopleura dolens, sp. n.

♂. Antennæ and body black; red spots on shoulders and patagia. Wings smoky hyaline; the veins and margins blackish, widest at apices and on inner margin and anal angle of hind wings.

Expanse, ♂ 22 mm.

Expanse, ♀ 25 mm.

Hab. Sixola.

Saurita latens, sp. n.

♂. Antennæ and body black; a red spot on shoulders and a small red dorsal spot at base of abdomen; fore tibiæ inwardly buff. Wings black-brown, the veins darker.

Expanse, ♂ 25 mm.

Expanse, ♀ 30 mm.

Hab. Juan Vinas, El Sitio.

Saurita rubripuncta, sp. n.

♀. Antennæ black, irrorated with white at apex. Body black; metallic-blue spots on frons, vertex, tegulæ, and metathorax; metallic streaks on thorax and patagia; lateral spots on abdomen; a transverse red streak at base of abdomen; sublateral white spots on two basal segments; base of abdomen below shot with dark green; basal segments fringed with white and followed by a large white spot; coxæ white. Wings hyaline, the veins black. Fore wings: the base black with a crimson spot; a broad transverse

median black band suffusing with the more broadly black inner margin at tornus; the apex broadly black, especially above vein 5. Hind wings: the outer margin narrowly black, the apex broadly black. Underneath with a crimson spot at base of both wings.

Expanse 29 mm.

Hab. Sixola, Banana River.

Saurita diffusa, sp. n.

♂. Antennæ and body black; metallic-green patches on frons, behind antennæ, on tegulæ, metathorax, and lateral and sublateral spots on abdomen; shoulders crimson; a dorsal crimson spot on base of abdomen; fore coxæ metallic green. Fore wings blackish brown, the veins black. Hind wings very broad, black; the costal margin broadly dark greyish buff.

Expanse 29 mm.

The female similar, but rather lighter brown; the hind wings normal, fuscous.

Expanse 30 mm.

Hab. Juan Vinas, El Sitio, Tuis.

Saurita submacula, sp. n.

Antennæ black. Body and wings dark brown; a few blue scales on frons, on tegulæ outwardly, and on mesothorax; a large crimson spot on patagia. Fore wings: some blue scales at base of costa and cell. Hind wings: a buff streak and a small patch of roseate scales at base below cell. Wings below: a red space at base of hind wings, narrower below cell and not reaching inner margin.

Expanse 36 mm.

Hab. La Laguna.

Argyrœides notha, sp. n.

Antennæ, head, collar, thorax, and first segment of abdomen black; frons white. Abdomen: second segment constricted, unscaled, otherwise dark brownish green above; laterally roseate, meeting ventrally on last two segments; roseate band ventrally on segments 3–5; segments 1 and 2 white below. Thorax below and legs black; femora and some lateral spots white; a crimson streak on fore tibiæ. Wings hyaline; the veins and margins narrowly black. Fore wings: a hyaline streak at base of costal margin; a crimson basal spot; a small crimson spot terminally below

vein 2. Hind wings: the apex and inner margin more broadly black.

Expanse 25 mm.

Hab. Juan Vinas.

Argyrœides spectrum, sp. n.

Antennæ reddish brown, the pectinations black. Body above black; a transverse buff streak behind metathorax. Abdomen: a lateral white streak on three basal segments; a ventral white streak. Thorax below with some white streaks. Legs light brown. Wings hyaline. Fore wings: the veins, base of inner margin, outer half of costal margin, and cilia light reddish brown; the outer margin from above vein 4 to apex narrowly dark brown, irrorated with light reddish brown. Hind wings: the outer margin from before vein 3 to apex broadly dark brown.

Expanse 28 mm.

Hab. Volcano Poas.

Chrysostola mellita, sp. n.

Palpi, head, collar, and thorax black; opalescent lilacine purple spots on vertex and tegulæ in front. Abdomen: first segment above black, mixed with yellow hairs dorsally; segments 2–5 yellow; last segments black, shot with lilacine purple; underneath yellow, except last two segments, which are black. Thorax below and legs yellow; tarsi black. Wings hyaline. Fore wings: the basal half of costal margin and veins, also inner margin to near tornus, yellow, irrorated with black at base; the outer half of veins and margins otherwise finely black; the apex broadly black; a black streak on discocellular. Hind wings: costal margin, veins, and inner margin yellow, the latter with some fuscous hairs; the apex broadly black, narrowing to vein 2; the veins black close to black area.

Expanse 30 mm.

Hab. Sixola.

Ecdemus obscuratum, sp. n.

Palpi ochreous and white at base, otherwise black, streaked with white in front; some ochreous below and at sides of eyes. Antennæ black, irrorated with white at tips. Collar and thorax black. Abdomen blue-black above, white ventrally; coxæ white; some whitish streaks on legs. Fore wings black, the veins distinct; a hyaline streak above and below median vein, with short streaks between veins 2–5,

all thinly irrorated with black scales. Hind wings hyaline white; the veins, costal margin, and outer margins blackish.

Expanse 25 mm.

Hab. Guapiles.

Antichloris puriscal, sp. n.

Palpi black, streaked with white in front. Shaft of antennæ dark green, the pectinations black. Head black and dark green, with red patches below at sides. Collar dark green. Thorax black, the patagia streaked with dark green. Abdomen black; basal segment dorsally blue-green, a bright green dorsal stripe and duller green lateral stripes; a sublateral white line. Legs black-green, inwardly streaked with buff; fore coxæ white. Wings velvety black. Fore wings: green streaks at base on subcostal, and above and below submedian; the apex white. Hind wings: the costal margin broadly silky grey-white.

Expanse 36 mm.

Hab. Puriscal Mts.

Aclytia albistriga, sp. n.

Palpi ochreous at base, otherwise grey-black, fringed with grey in front and whitish behind. Head, collar, and thorax black; white streaks on frons and patagia; ochreous spots on head behind, and ochreous scales on tegulæ outwardly. Abdomen metallic blue above, black sublaterally, white ventrally. Legs grey, streaked with white. Fore wings black-brown; a greyish-blue patch at base of inner margin; an oblique white fascia from below costa beyond middle to just above tornus. Hind wings blue-black; a hyaline streak from base below cell, including lower portion of cell outwardly and a little beyond cell; a slight hyaline streak at base of inner margin.

Expanse 32 mm.

Hab. Guapiles.

Agyrta conspicua, sp. n.

♂. Palpi red tipped with black. Antennæ black. Head crimson. Body above dark blue; a fine dorsal whitish line on abdomen; underneath irrorated with white. Legs black, streaked with white and blue; fore coxæ white. Wings and veins blue-black, the costal and inner margins shot with brilliant blue. Fore wings: a large hyaline space in and below cell, outcurved at vein 4 to near outer margin at vein 2. Hind wings: a broad hyaline streak

from base through lower part of cell and below it to near outer margin.

Expanse 45 mm.

Hab. Tuis.

Eucereon relegatum, sp. n.

Palpi ochreous brown at base, otherwise black. Head, collar, and thorax black; a brown line from behind antennæ across tegulæ; tegulæ dorsally and patagia edged with brown; shoulders brown; brown hairs on metathorax. Abdomen black above, laterally orange, expanding terminally and leaving only a dorsal black line; anus black; underneath yellowish white except on last segment. Legs black, streaked with buff. Fore wings greyish, the veins and inner margin dark brown, the former edged with lighter brown; oval black spots edged with buff, two basal, three antemedial from below cell, two medial above and below submedian; a long fuscous spot on costa extending across cell but shorter basally; two fuscous spots at end of cell and others beyond between the veins and on costa, the spot above vein 2 largest and suffusing with subterminal spot; subterminal fuscous spots, smallest between veins 3 and 5; terminal fuscous spots between the veins. Hind wings white, semihyaline; the veins light brown; the margins narrowly fuscous.

Expanse 42 mm.

Hab. Cartago, Juan Vinas, Avangarez.

This species is the Central American form of *E. setosum*, Sepp.

Correbia semitransversa, sp. n.

♂. Palpi black, streaked below with ochreous brown. Frons black. Vertex and collar ochreous brown with a black medial streak. Thorax black, the patagia anteriorly ochreous brown. Abdomen black; a lateral stripe and ventrally except last two segments ochreous brown. Fore wings ochreous brown; a medial black band from costa to submedian; a black space at apex streaked with steel-grey, the inner edge outbent below 5 and narrowing to vein 2. Hind wing semihyaline fuscous; the veins and outer margin black; the costal margin yellow except at apex and with some medial black marks.

Expanse 39 mm.

Hab. Juan Vinas.

Allied to *C. obtusa*, Druce.

Correbidia costinotata, sp. n.

Palpi fulvous yellow, tipped and streaked above with black. Antennæ and frons black. Vertex, collar, and thorax fulvous yellow with a black central streak. Legs black; coxæ and base of femora fulvous yellow. Abdomen black; a lateral yellowish streak on first three segments. Fore wings fulvous yellow; a large purplish-black patch at apex, its inner edge irregular; a small black spot medially on costa; a fine black streak on inner margin from just beyond base. Hind wings semihyaline yellowish white, the inner and outer margin suffused with black. Underneath the costal margins more deeply yellow.

Expanse 33 mm.

Hab. Juan Vinas, Tuis.

Allied to *C. elegans*, Druce.

Propyria flora, sp. n.

Body and fore wings dark green: some blue scales on thorax and base of costa. Hind wings: the outer margin broadly black; a lilacine-white space from base to middle below cell, broadly surrounded by brilliant light blue metallic scales.

Expanse 24 mm.

Hab. Cachi.

Allied to *P. criton*, Druce.

Arctiidæ.

Prumala herbosa, Schs.

In the 'Annals' for last August I described two forms under the above name. The first male described must sink as a synonym of *P. underwoodi*, Roths., erroneously described as a *Diacrisia*. The name "*herbosa*" can be retained for the males mentioned as having the postmedial band reduced to a line. The female of *P. herbosa* has the postmedial spots almost obsolescent, whereas in *P. underwoodi* they are well marked.

Automolis priscilla, sp. n.

♂. Palpi yellow at base, otherwise grey-white with a fine lateral dark streak. Head orange; a black transverse line on frons and a black spot on vertex. Collar orange with two olive-brown dorsal lines. Thorax olive-brown; a dorsal whitish line; patagia orange, edged with olive-brown and

whitish lines. Abdomen orange ; a large dorsal black patch on three basal segments ; last segment black ; anal hairs whitish. Legs whitish grey, with dark grey streaks ; fore coxæ orange. Fore wings olive-brown, the submedian fold and veins white except on large postmedial yellow spot, broad on costa, narrowing to vein 3. Hind wings yellow ; the outer margin fuscous grey from anal angle to just above vein 3.

Expanse 33 mm.

The female has a black dorsal spot beyond the basal patch, and a lateral black line on abdomen. The hind wings have the outer margin broadly black.

Expanse 38 mm.

Hab. El Sitio, La Florida.

Closely allied to *A. persimilis marginata*, R., but differs in the markings of the head and collar, and narrow margin to hind wings in male.

Pelochyta misera, sp. n.

♂. Palpi orange, the tips dark brown ; a black lateral spot. Frons orange, spotted with black. Vertex ochreous brown ; two black spots, one between antennæ, the other posteriorly. Collar orange in front, dark brown behind ; four black spots. Thorax dark brown, some orange on shoulders. Abdomen above dark brown on basal half, black terminally ; underneath orange ; lateral black spots. Legs chiefly black ; fore coxæ orange spotted with black. Wings dark brown. Fore wings : a small orange spot at base ; a black shade on discocellular.

Expanse 37 mm.

Hab. Guapiles.

Halisidota montana, sp. n.

♂. Antennæ light brown. Body ochreous buff above, the abdomen dorsally tinged with orange ; two brown points on collar. Fore wings yellowish ; the extreme costa tinged with light brown ; the inner margin from beyond base dark brown ; a brown spot across middle of discocellular ; some small brown spots along costa and along the faint traces of darker lines, sometimes obsolescent. Hind wings semi-hyaline, whitish tinged with yellow on inner margin.

Expanse 42 mm.

Hab. Volcano Poas.

Allied to *H. flavescens*, R.

Halisidota cirphis, sp. n.

♂. Ochreous; pectinations of antennæ, head, and collar tinged with pale olivaceous brown, and with small fuscous spots on collar, and on patagia anteriorly and medially; the ochreous hairs at base of abdomen shading to brown posteriorly. Fore wings with scattered brown scales not forming lines, a black spot at end of cell at veins 4 and 5, and a minute spot in cell medially; a subterminal row of small dark brown spots. Hind wings paler, the area below cell and vein 2 shaded with fuscous brown; a marginal dark streak below vein 6. Underside with fuscous streaks below cell and along inner margin. Tarsi tipped with dark brown.

Expanse 38 mm.

Hab. Juan Vinas, Volcano Turrialba, 5800 ft.

Halisidota turrialba, sp. n.

Palpi and head ochreous brown. Collar and thorax ochreous yellow, streaked with brown. Abdomen brown above, yellowish white laterally and underneath. Fore wings yellow, heavily shaded with brown, except at base, on outer margin and apical third of costal margin, forming a dark space at end of cell, a broad streak to apex, and a large medial space from cell to inner margin: on this latter are elongated lunular yellow spots below vein 2, and between veins 2 and 4, also a yellow patch on middle of inner margin; an elongated yellow spot at end of cell above median and one beyond cell between 5 and 6; some brown irrorations at base, except on inner margin, and on outer margin, forming a series of small submarginal and marginal spots. Hind wings fuscous brown; the costal margin broadly yellowish white; a small brown spot at apex.

Expanse 59 mm.

Hab. Turrialba, 5800 ft.

Halisidota subannula, sp. n.

♂. Ochreous: pectinations, a line on frons, spots on vertex and tegulæ and dorsal edge of patagia brown. Fore wings: the lines brown; a basal and subbasal line almost meeting on submedian; an antemedial line outwardly broadly shaded with brown on costa, followed by fine annular spots and a fine medial line; a linear white spot at end of cell preceded by a short black dash and outwardly edged by the inner line of postmedial, which is geminate, wavy, partly filled in with brown shadings; the subterminal nearly

straight, outwardly shaded with brown and followed by an irregular fine line; submarginal and marginal line coalescing at veins, the latter extending outwardly between veins and forming dark points on the white cilia; a dark submarginal point between 5 and 6; the inner margin from beyond base dark brown. Hind wings semihyaline yellow. On the underside of hind wings a small annular spot on costa distinguishes this species from any allied forms.

Expanse 34 mm.

Hab. Banana River.

Hypocrisias gemella, sp. n.

♂. Head and collar cinnamon-brown, with darker edging to tegulæ. Thorax yellowish buff. Abdomen brown above, yellowish buff below. Fore wings yellowish buff, thickly irrorated with dull brown, except on basal space, which is crossed by some fine brown lines, and is limited by a dull brown antemedial shade outcurved on its basal side; a medial spot on costa, one at end of cell, surmounted by a smaller costal spot, postmedial and subterminal spots clear yellowish buff, edged with dull brown; the postmedial spots obsolescent between veins 2 and 5; the subterminal spot between 3 and 4 replaced by a brown point; the veins, a terminal line, and cilia brown. Hind wings white, tinged with brown; the veins and a terminal line brown; cilia brownish white.

Expanse 38 mm.

The female rather brighter in colour, the spots larger and all present; the postmedial between 3 and 5 very small.

Expanse 40 mm.

Near *H. punctata*, Druce.

Ecpantheria perplexa, sp. n.

♂. Frons black. Vertex, collar, and thorax white; black annuli on collar and mesothorax; elongated linear black spots on patagia and metathorax. Abdomen dorsally brown on two basal segments, otherwise dark blue, with dorsal orange spots sometimes expanding and forming transverse orange bands; lateral orange stripes or spots; a sublateral black line; ventrally white with rows of black spots. Fore wings white; basal, antemedial, medial, postmedial, and subterminal annuli, some filled in with light grey; large terminal black spots, round, cuneiform, or elongated; the costal spots large, entirely black, the medial spot suffusing with a black spot at end of cell, below which is a black

streak and another black spot beyond cell. Secondaries white; a black streak along inner margin; a broad black medial fascia from end of cell to inner margin; a black spot on anal lobe.

Expanse 53 mm.

Hab. Guapiles, Limon, Tuis.

Paranerita niobe, sp. n.

♀. Palpi roseate above, yellowish below. Frons, collar, and thorax purplish brown; vertex yellow. Abdomen above crimson. Body below whitish. Fore wings purplish brown; a yellow space medially on costa connected with a yellowish-white spot in cell posteriorly rounded, the whole edged by a fine red line, and looking like an inverted hat with a wide brim; a yellow spot on costa at apex; the outer margin narrowly yellow, inset at vein 4, and inwardly lunular from 4 to apex. Hind wings roseate, the costal margin yellowish.

Expanse 35 mm.

Differs from *P. grandis*, R., in the colour of hind wings.

Hyponerita amelia, sp. n.

♂. Palpi roseate, yellowish in front. Head yellow; some roseate on frons and on vertex behind. Collar and thorax lilacine brown, the patagia and mesothorax irrorated with red. Abdomen roseate above. Body below luteous; fore coxæ roseate. Fore wings purplish brown; a large yellow spot on middle of costa, extending to vein 4, edged with crimson, which extends on costa towards base and apex; a small yellow spot below vein 2 edged with crimson which coalesces with the border of large spot; base of inner margin yellow, shaded above with crimson; outer margin yellow, widest below vein 4, and inwardly edged by a crimson line, outwardly lunular from vein 4 to apex. Hind wings roseate.

Expanse 24 mm.

Hab. Sixola.

Noctuidæ.

Letis albociliata, sp. n.

♀. Body and wings dark brown, the abdomen shaded with dark violaceous. Fore wings: some whitish irrorations chiefly on costa; antemedial buff on costa, inset, straight, in cell black, below cell lunular, black, inwardly edged with light brown; orbicular round, black, circled with light brown; reniform large, oval, somewhat oblique, linear,

black, outwardly edged with buff; a wavy black medial line beyond reniform, followed by two fainter black lines less wavy; the postmedial lunular black, outwardly edged with light brown, and with white on costa; subterminal small clusters of whitish scales; a wavy submarginal black line; a marginal straighter brown line; cilia white; fringe on inner margin fuscous. Hind wings slightly glossed with purple; the lines continued from fore wings; terminal yellowish shades at tips of veins; cilia black from vein 4 to anal angle. Underneath lighter brown; black spots at end of cells; fuscous medial and postmedial lines, with a fainter geminate line between them; subterminal white spots more distinct.

Expanse 84 mm.

Hab. La Florida, Guapiles.

Allied to *L. iphianassa*, Cr.

Letis tuisana, sp. n.

♂. Head, thorax, and wings dark brown, glossed with purplish. Abdomen black, tinged with purple; fine transverse lilacine lines posteriorly on segments. Fore wings: the base of costa with white irrorations; a fuscous streak on base of costa; a fuscous streak in cell more remote from base; antemedial black, interrupted in cell by orbicular, which is black, annular, outwardly edged with light brown and lilacine; reniform large, outlined as in orbicular, closely followed by a wavy geminate black medial line, filled in with lilacine brown; a similar line between the medial and postmedial, which is broad, lilacine brown, edged and crossed by lunular black lines, and terminating in a small white spot on costa; a subterminal fuscous shade spotted with lilacine brown, which becomes a line below vein 2; a submarginal wavy black line, outwardly shaded finely with light brown between the veins; a marginal finer black line; cilia fuscous. Hind wings with similar lines; the margin deeply crenulate; buff spot on cilia terminally. Fore wings below greyish brown; a fuscous spot in cell; a dark spot on discocellular; a dentate fuscous postmedial line; subterminal lilacine-white spots, forming a line below vein 3 inwardly shaded with fuscous; small black marginal spots between the veins. Hind wings below darker than fore wings and strongly tinged with purple; a large black spot on discocellular; a fine fuscous medial line, followed by a faint geminate dark shade; the postmedial black, lunular, dentate, outwardly shaded with lilacine; a broad fuscous subterminal shade,

outwardly shaded with white from inner margin to vein 3, and from vein 6 to apex.

Expanse 80 mm.

The female has the lines shaded with lilacine, the spots outwardly edged with white; the postmedial broadly white, lunular dentate, crossed by a heavy fuscous-brown line; the subterminal shade spotted, white, the spot below costa largest. Underneath the postmedial line is outwardly shaded with white.

Expanse 87 mm.

Hab. Tuis.

Trissophaes colubra, sp. n.

♂. Head, collar, and thorax dark violaceous brown; golden-brown patches on metathorax; a few lilacine scales on patagia. Abdomen orange; fuscous-brown dorsal tufts at base. Fore wings: the base to antemedial golden brown, crossed by a dark basal line; the antemedial inwardly oblique from costa to submedian near base, fine, blackish; the space beyond to outer line shaded with silky lilacine, and crossed by some fine brown lines; the orbicular a black point; the reniform consisting of two brownish lines and followed by a postmedial brown line from costa to vein 5; the outer line blackish from apex to inner margin before middle, and followed by a broad golden-brown shade, changing to lilacine brown on outer margin and towards apex; a submarginal dark streak between veins 3 and 7. Hind wings orange; the outer margin above vein 2 broadly black, its inner edge somewhat dentate; an irregular postmedial black fascia from vein 5 to inner margin above angle. Underneath the outer margin of hind wings is broadly black from veins 2–7, the apex irrorated with black.

Expanse 74 mm.

The female similar, except the fore wings which are dark silky brown, strongly tinged with purplish and with dull lilacine on outer margin; the basal and antemedial lines and medial shade inwardly oblique from costa, dark reddish brown, most noticeable on lobe of inner margin; the reniform projecting inwardly and outwardly along median vein, dark reddish brown; the postmedial irregular wavy, very oblique inwardly from vein 4 to inner margin; the outer line oblique from apex to between 5 and 6, straight to between 3 and 4 and outwardly shaded with very dark brown, then very oblique to middle of inner margin, where it is followed by a large reddish-brown space to near tornus, and has a whitish point on it between veins 2 and 3; sub-

terminal greyish shadings between 2 and 4, and others at tornus ; dark marginal striæ above vein 4 to apex.

Expanse 90 mm.

Hab. Juan Vinas, El Sitio.

Also in B.M. from Peru.

Trissophaes anguina, sp. n.

♂. Palpi dark grey-brown. Thorax olive-brown. Abdomen dorsally grey, tinged with yellow laterally, and with transverse yellowish lines on segments posteriorly. Fore wings silky lilacine brown, finely striated ; basal, antemedial, and medial darker shades, interrupted on median vein ; a similar round shade at end of cell and a short line beyond it ; a fine distinct line from apex to beyond middle of inner margin, outwardly shaded with darker brown above vein 2 ; terminal brown spots from vein 2 to apex ; inner margin with a triangular lobe on basal half and excised before tornus. Hind wings deep yellow ; a fuscous postmedial patch from vein 3 to anal angle ; outer margin broadly fuscous above vein 2.

Expanse 53 mm.

Hab. Tuis.

There is a female of this species in the B.M. from the Godman Collection, where it was referred erroneously to *T. collusoria*, Cr.

Graphigona ? *magnifica*, sp. n.

♀. Body dull brown, faintly tinged with lilacine on head, collar, and thorax anteriorly, more strongly so on abdomen terminally and laterally ; the abdomen above with long dark reddish-brown hairs. Fore wings dull dark brown ; the costal margin medially tinged with lilacine, extending downwards across cell basally, and outwardly across reniform, which consists of a small reddish-brown crescent, followed by light brown and buff scales ; a postmedial lilacine shade from costa to vein 4 ; a large round white spot between veins 2 and 3 and a smaller spot between 3 and 4 ; a large subterminal grey and light brown spot between veins 4 and 6, crossed by black striæ, and two smaller similar spots between 6 and 8 extending towards apex ; a few buff striæ on costa and outer portion of wing. Hind wings black ; a large postmedial roseate space from vein 5 to near anal angle. Fore wings below with a large white patch from vein 5 to near tornus. Hind wings below with roseate striæ between roseate patch and costa.

Expanse 120 mm.

Hab. San José.

This may be the female of *G.* ? *roseifer*, Feld., and was taken by Mr. C. H. Lankester in his house at San José.

Lacosomidæ.

Cicinnus pudens, sp. n.

♂. Body and wings light brown, thinly irrorated with black. Fore wings: a fine antemedial fuscous line angled on costa, then straight to inner margin; a small fuscous-brown spot at end of cell; a fuscous-brown oblique shade subterminally on costa, a large similar shade beyond to apex, and a fine geminate fuscous line from vein 7 to inner margin; a marginal dark brown shade from vein 4 to tornus. Hind wings: the outer margin shaded with dark brown; a fine fuscous postmedial line forming an outward curve near inner margin.

Expanse 45 mm.

Hab. Sixola, Juan Vinas, Avangarez.

Allied to *C. incerta*, Mösch.

Castniadæ.

Castnia drucei, sp. n.

♂. Head, thorax, and basal half of abdomen dorsally dark brown; abdomen otherwise whitish buff. Fore wings dark brown, shaded with dark green, an indistinct pale band from middle of costa to tornus, varying in intensity. Hind wings: the base dark brown, otherwise light reddish brown, except a large white area at anal angle and inner margin tapering to a point medially at vein 5. Fore wings below light brown; the transverse band broad, white, preceded by a reddish-brown shade and followed by a dark brown shade to a postmedial wavy white band from costa to vein 4; faint subterminal whitish spots, chiefly between veins 3 and 5. Hind wings below light brownish buff; a fine reddish medial line broken into spots near inner margin which is white, and followed by a faint brownish shade down-curved to anal angle; faintly darker marginal shades.

Expanse 84 mm.

The female differs in having the transverse band on fore wings white, and there are six postmedial white spots, the three lower ones between veins 4 and 7 outcurved.

Expanse 89 mm.

Hab. Rio Grande, Guapiles, San Geronimo. At Avangarez a male form was found which has the fore wings almost as light reddish brown as the hind wings and the transverse line on fore wings very distinct.

Castnia drucei is well figured in the 'Biologia' as *C. futilis*, Wlk., but is quite distinct. The type of *C. futilis* is probably only a form of *C. atymnius*, Dalm., as already suggested by Westwood.

Castnia delecta, sp. n.

♂. Palpi white in front. Frons black with some brown outwardly. Vertex, collar, and thorax brown, shading to reddish brown on abdomen above; abdomen below orange-yellow; thorax whitish grey; legs chiefly reddish brown; coxæ white. Fore wings reddish brown, thinly irrorated with dull brown; a large round spot at end of cell; a dark brown line from middle of inner margin to apex, somewhat obsolescent above vein 7; a subterminal small white spot edged with dark brown between 7 and 8; cilia dark brown. Hind wings reddish; a black shade at base of inner margin; five large black spots from near tornus to vein 6, and a smaller brown spot above vein 6; a narrow brown terminal shade, inwardly lunular and partly irrorated by a black line, from tornus to vein 6.

Expanse 49 mm.

Hab. Esperanza.

♀. Fore wings yellow, faintly tinged with green, more darkly shaded at apex, on inner margin beyond line, and on discal spot which is larger and extends on to costa; the subterminal white spot larger, and there is another minute white spot below vein 7; the basal third shaded with light reddish brown. Hind wings reddish yellow; the veins orange; the spots smaller, edged with reddish brown, somewhat indentate on veins, and the black line more distinct.

Expanse 57 mm.

Hab. Cordova, Mexico.

Gazera carilla, sp. n.

♂. Antennæ yellow, black at base. Head black, spotted with white; white lines behind eyes; collar black, shaded with green, edged posteriorly with yellow. Thorax dark brown, the patagia black shaded with green; yellow spots on mesothorax and metathorax. Abdomen above rufous at base, shading to green-grey, a lateral rufous band; a sublateral black stripe; underneath whitish yellow. Legs black,

streaked with white; coxæ yellow. Fore wings black; the basal half of cell and a broad fascia above inner margin from base to beyond vein 2 reddish brown; a spot at end of cell and streak on costa above it yellow, irrorated with pale olive-brown; a postmedial quadrate, downwardly oblique, brownish patch crossed by vein 3; a subterminal oblique row of spots from costa to vein 4, yellowish, thickly irrorated with pale olive-brown; a marginal row of yellowish-white spots, smaller and quadrate between veins 3–6, otherwise elongated, the subcostal spots irrorated with brown. Hind wings rufous; a broad black fascia along subcostal; the outer margin black, deeply dentate inwardly on veins, the interspaces with yellowish spots at their base; a postmedial black fascia from veins 2–4. Underneath the spots on fore wings are chiefly clear yellow.

Expanse 96 mm.

Hab. Carillo.

Allied to *G. zagrea*, Feld., but the basal brown markings are entirely different.

XVIII.—*A Synopsis of the Marsipobranchs of the Order Hyperoartii.* By C. Tate Regan, M.A.

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The Hyperoartii (Lampreys) are Marsipobranchs with the nasal aperture on the upper surface of the head and the naso-palatine canal ending blindly posteriorly. Eyes well-developed (in the adult). Two semicircular canals. Mouth with expanded toothed lips; tongue with a single anterior and a pair of posterior cuspidate laminæ (compound teeth). Branchial sacs seven on each side, not far behind the head, communicating internally with a subœsophageal canal which opens anteriorly into the pharynx; an extra-branchial skeleton forming a basket-work. Eggs small, numerous; segmentation holobiastic; a metamorphosis. A caudal and two dorsal fins, sometimes united.

The larvæ (*Ammocœtes*) appear to be extremely similar in all the northern genera. They are toothless, with a small transverse lower lip and a hood-like upper lip; a circle of fringed barbels surrounds the mouth. The eyes are rudimentary and subcutaneous, the small gill-openings lie in a

groove, and the vertical fins are confluent. The branchial pouches communicate directly with the œsophagus.

Family **Petromyzonidæ**.

Characters included in the ordinal diagnosis.

Coasts and rivers of temperate regions, most or all spawning in fresh water.

The specimens enumerated are those in the British Museum collection.

Synopsis of the Genera.

I. Two tricuspid supraoral laminæ ..... 1. *Mordacia.*

II. A single supraoral lamina.

A. Anterior lingual lamina bi- or tricuspid; supraoral lamina broad, quadricuspid ..... 2. *Geotria.*

B. Anterior lingual lamina with two curved denticulated ridges separated by a median longitudinal groove; supraoral lamina narrow, bicuspid ..... 3. *Petromyzon.*

C. Anterior lingual lamina with a single transverse denticulated ridge.

1. Supraoral lamina narrow.

Supraoral lamina bi- or tricuspid; dorsal fins united. 4. *Ichthyomyzon.*
Supraoral lamina unicuspid; dorsal fins separate .. 5. *Caspiomyzon.*

2. Supraoral lamina broad, bi- or tricuspid.

a. Disc covered with numerous teeth, radially arranged. 6. *Eudontomyzon.*

b. Disc with a marginal series of small teeth, an anterior group of teeth, and 3 or 4 enlarged teeth on each side; no radial series of teeth.

Last pair of lateral teeth connected by a posterior series of teeth parallel to the marginal series .. 7. *Entosphenus.*
Posterior part of disc toothless, except for the marginal series ..... 8. *Lampetra.*

1. Mordacia.

Caragola, Gray, Chondropt. p. 143 (1851), or Proc. Zool. Soc. 1851, p. 239.

Mordacia, Gray, *t. c.* p. 144, and *l. c.*; Günth. Cat. Fish. viii. p. 507 (1870).

Disc covered with radially arranged teeth. Two well-separated tricuspid supraoral laminæ; infraoral lamina with 9 unequal cusps. Anterior lingual lamina with a V-shaped denticulated ridge, the apex of the V directed backwards, the most anterior denticle on each side more or less enlarged. Dorsal fins separate.

Australia; Chile.

Synopsis of the Species.

I. Enlarged cusps of anterior lingual lamina small, the denticulated ridge evident.

The two most anterior of the radial series of labial teeth meet behind and, diverging in front, are separated by a single tooth ..... 1. *lapicida.*

The two most anterior of the radial series of labial teeth are entirely separated by a group of three teeth .... 2. *mordax.*

II. Enlarged cusps of anterior lingual lamina very strong, hiding the denticulated ridges ..... 3. *acutidens.*

1. *Mordacia lapicida.*

Caragola lapicida, Gray, Chondropt. p. 143, pl. i. fig. 5 (1851), or Proc. Zool. Soc. 1851, p. 239.
Mordacia mordax (part.), Günth. Cat. Fish. viii. p. 507 (1870).
Mordacia lapicida, Plate, Zool. Jahrb. Suppl. v. 1902, p. 656, pl. xix. figs. 3–4.

Chile.

1. 160 mm. (type of the species).	Valparaiso.	

2. *Mordacia mordax.*

Petromyzon mordax, Richards. Ereb. & Terr. Fish. p. 62, pl. xxxviii. figs. 3–6 (1848).
Mordacia mordax, Gray, Chondropt. p. 144, pl. i. fig. 6 (1851), or Proc. Zool. Soc. 1851, p. 239, pl. iv. fig. 6; Ogilb. Proc. Linn. Soc. N.S.W. xxi. 1896, p. 400; Plate, Zool. Jahrb. Suppl. v. 1902, p. 654, pl. xix. figs. 1–2.
Mordacia mordax (part.), Günth. Cat. Fish. viii. p. 507 (1870).

New South Wales; Victoria; Tasmania.

1. 250 mm. (type of the species).	Tasmania.	Haslar Coll.
2. 330 mm.	„	M. Allport, Esq.

3. *Mordacia acutidens.*

? *Petromyzon anwandteri*, Philippi, Arch. f. Nat. 1863, p. 207, pl. x. fig. *b*.
Petromyzon acutidens, Philippi, ib. 1864, p. 107, or Ann. & Mag. Nat. Hist. xvi. 1865, p. 221.
Mordacia acutidens, Plate, Zool. Jahrb. Suppl. v. 1902, p. 657, pl. xix. figs. 5–6.

Chile.

1–2. 320–330 mm.	Chile.	Gerrard.

2. Geotria.

Geotria, Gray, Chondropt. p. 142 (1851); Günth. Cat. Fish. viii. p. 508 (1870).
Velasia, Gray, *l. c.*
Yarra, Castelu. Proc. Zool. Soc. Vict. i. 1872, p. 231.
Neomordacia, Castelu. *t. c.* p. 232.
Exomegas, Gill, Proc. U.S. Nat. Mus. v. 1882, p. 524.
Macrophthalmia, Plate, Sitzungsb. Ges. naturf. Fr. Berlin, 1897, p. 137.

Disc covered with radially arranged teeth. A single broad quadricuspid supraoral lamina; infraoral lamina usually weakly cuspidate. Anterior lingual lamina bi- or tricuspid. Dorsal fins separate.

Australia; New Zealand; Chile.

Synopsis of the Species.

I. Disc small, with the labial teeth close together, almost imbricating; gular pouch small or absent. (*Velasia.*)

Inner pair of supraoral cusps spatulate; anterior lingual plate bicuspid, the cusps very strong; length of base of first dorsal considerably more than its distance from the second ..... 1. *chilensis.*

Inner pair of supraoral cusps either ovate or triangular and acutely pointed; anterior lingual plate usually tricuspid; length of base of first dorsal from a little less to a little more than its distance from the second ..... 2. *stenostoma.*

II. Disc large, with the labial teeth well separated; a gular pouch. (*Geotria.*)

A. Supraoral lamina prominent.

Lateral cusp of supraoral lamina broader than the adjacent lateral part of the lamina, from which it is separated by a groove; anterior lingual tooth tricuspid; base of first dorsal fin a little shorter than its distance from the second ..... 3. *saccifera.*

Lateral cusp of supraoral lamina narrower than the adjacent lateral part of the lamina; anterior lingual tooth bicuspid; base of first dorsal longer than its distance from the second..... 4. *australis.*

B. Supraoral lamina hidden; anterior lingual tooth tricuspid; base of first dorsal much longer than its distance from the second. 5. *macrostomus.*

1. *Geotria chilensis.*

Velasia chilensis, Gray, Chondropt. p. 143, pl. i. fig. 4 (1851).
Geotria chilensis (part.), Günth. Cat. Fish. viii. p. 509 (1870).

1. 380 mm. (type of the species). Chile.

2. *Geotria stenostoma.*

Geotria chilensis (part.), Günth. Cat. Fish. viii. p. 509 (1870).
Velasia stenostomus, Ogilby, Proc. Linn. Soc. N.S.W. xxi. 1896, p. 409.
Macrophthalmia chilensis, Plate, Sitzungsb. Ges. naturf. Fr. Berlin, 1897, p. 137.
Geotria chilensis, Plate, Zool. Jahrb. Suppl. v. 1902, p. 660, pl. xix. figs. 7–16.
Geotria stenostomus, Plate, *t. c.* p. 671, pl. xix. fig. 21.

Australia; New Zealand; Chile.

1. 510 mm.	Otago.	Otago Mus.
2–3. 500–530 mm.	New Zealand.	W. Colenso, Esq.
4. 540 mm.	Swan River.	

In all these the middle cusp of the anterior lingual lamina is well developed, but shorter and weaker than the lateral cusps. Ogilby (p. 410) describes the median cusp as being "as long as the outer pair," but elsewhere (p. 416) he states that the middle cusp is absent in one of his three examples. Four of Plate's specimens agree in this character with those listed above, but in a fifth the median cusp is as long as the others, and in a sixth (his *G. stenostomus*) not only as long but as strong as the lateral cusps.

3. *Geotria saccifera*, sp. n.

New Zealand.

1. 420 mm. (type of the species).	Otago.	Otago Mus.

4. *Geotria australis.*

Geotria australis, Gray, Chondropt. p. 142, pl. ii. (1851), or Proc. Zool. Soc. 1851, p. 238; Günth. Cat. Fish. viii. p. 508 (1870); Ogilby, Proc. Linn. Soc. N.S.W. xxi. 1896, p. 422; Plate, Zool. Jahrb. Suppl. v. 1902, p. 668, pl. xix. figs. 17–19.
Velasia chilensis, Philippi, Arch. f. Nat. 1857, p. 266, and 1863, pl. x. fig. *a*.
Thysanochilus valdivianus, Philippi, *t. c.* p. 268.
Geotria allportii, Günth. Proc. Zool. Soc. 1871, p. 675, pl. lxx.

Australia; Chile.

1. 480 mm. (type of the species).	Inkaspinki.	R. A. Pain, Esq.
2. 410 mm.	S. Australia.	Army Med. Coll.
3. 350 mm. (type of *G. allportii*).	Tasmania.	M. Allport, Esq.

5. *Geotria macrostoma.*

Petromyzon macrostomus, Burmeister, Ann. Mus. Buenos Aires, pt. 5, 1868; Act. Soc. Palæont. p. xxxvi; Günth. Cat. Fish. viii. p. 506 (1870).

Exemegas macrostomus, Gill, Proc. U.S. Nat. Mus. v. 1882, p. 524; Berg, Commun. Mus. Buenos Aires, i. 1899, p. 91.
Geotria macrostoma, Berg, Ann. Mus. La Plata, Zool. i. 1893, p. 3, pl. i.
Geotria macrostoma, var. *gallegensis*, Smith, Bih. Svensk. Vet.-Akad. Handl. xxvi. iv. no. 13, p. 26, pl. iv.

Argentina; Patagonia.

Recent descriptions show that this species is a true *Geotria*; the supraoral lamina appears to have the same form as in the other species of the genus; the infraoral lamina is absent or deciduous, but this may be the case in *G. australis* also; the so-called enlarged outer series of teeth seem to be the fringes of the disc.

3. Petromyzon.

Petromyzon (part.), Linn. Syst. Nat. ed. 10, p. 230 (1758); Günth. Cat. Fish. viii. p. 500 (1870).
Petromyzon, Gray, Chondropt. p. 143 (1851).
Bathymyzon, Gill, Proc. U.S. Nat. Mus. 1883, p. 254.

Disc covered with radially arranged teeth. A single narrow bicuspid supraoral lamina; infraoral lamina cuspidate. Anterior lingual lamina with two curved denticulated ridges separated by a median longitudinal groove. Dorsal fins separate.

North Atlantic and Mediterranean, entering rivers.

1. *Petromyzon marinus.*

Petromyzon marinus, Linn. Syst. Nat. ed. 10, p. 230 (1758); Günth. Cat. Fish. viii. p. 501 (1870); Day, Fish. Brit. ii. p. 356, pl. clxxviii. (1884); Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 10; Berg, Bull. Imp. Acad. St. Petersb. (5) xxiv. 1906, p. 176.
Bathymyzon bairdii, Gill, Proc. U.S. Nat. Mus. 1883, p. 254; Jord. & Everm. *t. c.* p. 9.
Petromyzon dorsatus, Gage, Wilder Quarter Century Book, p. 425, pls. i., iii., & vi. fig. 19 (1893).
Petromyzon marinus unicolor, Jord. & Everm. *t. c.* p. 9.

Infraoral lamina with 7 to 9 cusps; 4 inner labial teeth on each side enlarged, bicuspid.

North Atlantic and Mediterranean, entering rivers in Europe and North America.

1. 780 mm.	——.	Dr. F. Day.
2. 600 mm.	Baltic.	Haslar Coll.
3. 210 mm.	Scotland.	Dr. Johnston.
4. 550 mm.	Lough Neagh.	R. Patterson, Esq.
5. 630 mm.	Devonshire.	
6. 800 mm.	——.	London Market.
7. 620 mm.	Holland.	Lidth de Jeude Coll.

8. 720 mm.	Coruña.	Mons. V. L. Seoane.
9. 800 mm.	Lisbon.	Rev. R. T. Lowe.
10. 170 mm.	Mediterranean.	
11. 210 mm.	W. Africa.	J. C. Salmon, Esq.
12. 180 mm.	Nova Scotia.	M. Jones, Esq.
13, 14. 620–640 mm.	New York.	
15. 530 mm.	Merrimack R.	
16. 270 mm.	Muscatine, Iowa.	Field Mus.
17. 170 mm.	Val-de-Grace, U.S.A.	Dr. F. Day.

Specimen no. 11 has the supraoral cusps small and close together and the infraoral cusps weak, as described for *Bathymyzon bairdii*.

4. Ichthyomyzon.

Ichthyomyzon, Girard, Pac. R. R. Surv. x. p. 381 (1858).

Disc covered with radially arranged teeth. A single narrow bicuspid or tricuspid supraoral lamina; infraoral lamina cuspidate. Anterior lingual lamina with a single transverse denticulated ridge. Dorsal fins united.

Eastern North America.

1. *Ichthyomyzon bdellium.*

Petromyzon argenteus (non Bloch), Kirtland, Bost. Journ. N. H. iii. 1840, p. 342, pl. iv. fig. 3.
Petromyzon bdellium, Jord. Cat. Fish. N. Am. p. 4 (1885).
Ichthyomyzon concolor, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 11*.

Supraoral lamina bicuspid; all the labial teeth unicuspid; infraoral lamina with 7 cusps.

Great Lakes and Upper Mississippi.

1. 240 mm.	Louisville, Kentucky.	Smithsonian Inst.

2. *Ichthyomyzon castaneus.*

Ichthyomyzon castaneus, Girard, Pac. R. R. Surv. x. p. 381 (1858); Günth. Cat. Fish. viii. p. 507 (1870); Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 11.
Ichthyomyzon hirudo, Girard, *t. c.* p. 382; Günth. *l. c.*

Supraoral lamina tricuspid; some of the lateral labial teeth bicuspid; infraoral lamina with 7 to 12 cusps.

Mississippi.

* I cannot see that the larva described by Kirtland as *Ammocœtes concolor* differs in any way from that of *Lampetra planeri*.

5. Caspiomyzon.

Caspiomyzon, Berg, Bull. Acad. Imp. St. Petersb. (5) xxiv. 1906, p. 177.
Agnathomyzon, Gratzianow, Dneve. zool. otd. obsc. liub. jest. Moskva, iii. 1907, p. 18.

Disc covered with radially arranged teeth. A single narrow unicuspid supraoral lamina; infraoral lamina cuspidate. Anterior lingual lamina with a single transverse denticulated ridge. Dorsal fins separate.

Caspian Sea and rivers flowing into it.

1. *Caspiomyzon wagneri.*

Petromyzon wagneri, Kessler, Trud. St. Petersb. Obshch. Estestv. i. 1870, pp. 207, 302, pl. iii. figs. 4, 5.
Caspiomyzon wagneri, Berg, Bull. Acad. Imp. St. Petersburg, (5) xxiv. 1906, p. 178.
Agnathomyzon wagneri, Gratzianow, Dneve. zool. otd. obsc. liub. jest. Moskva, iii. 1907, p. 18.

Caspian Sea and the rivers falling into it.

1–3. 300–330 mm.	Astrachan.	St. Petersburg Mus.
4. 340 mm.	„	„

A second species, *C. caspicus*, has been described (*Agnathomyzon caspicus*, Gratzianow, Dneve. zool. otd. obsc. liub. jest. Moskva, iii. 1907, p. 18; *Caspiomyzon caspicus*, Gratzianow, Trd. otd. icht. obsc. Moskva, vi. 1907, p. 18); it is said to differ from *C. wagneri* only in the dentition of the tongue and is probably a synonym.

6. Eudontomyzon, gen. nov.

Disc covered with radially arranged teeth. A single broad bicuspid supraoral lamina; infraoral lamina cuspidate. Anterior lingual lamina with a single transverse denticulated ridge. Dorsal fins separate.

Transylvania.

1. *Eudontomyzon danfordi*, sp. n.

Labial teeth numerous, small, pointed; on each side 3 enlarged teeth, the first and third uni- or bicuspid, the middle one bi- or tricuspid. Infraoral lamina with 9 to 11 cusps. Anterior lingual lamina usually with an enlarged median cusp.

Transylvania.

1–6. Adult, 120–220 mm. (types of the species).	Transylvania.	C. G. Danford, Esq., and J. A. Harvie-Brown, Esq.
7–12. Larvæ, 95–185 mm.	„	„
13. Adult, 210 mm.	R. Sebés.	C. G. Danford, Esq.

7. Entosphenus.

Entosphenus, Gill, Proc. Ac. Philad. 1862, p. 331.

Disc without radially arranged series of teeth, but with a marginal series of small teeth, an anterior group of teeth, 3 or 4 enlarged teeth on each side, and a posterior series of small teeth, parallel to the marginal series, connecting the last pair of enlarged lateral teeth. A single broad bicuspid or tricuspid supraoral lamina; infraoral lamina cuspidate. Anterior lingual lamina with a single transverse denticulated ridge. Dorsal fins separate or subcontinuous.

Europe; North America; Japan.

Synopsis of the Species.

I. Supraoral lamina tricuspid; infraoral lamina with 5 or 6 cusps; on each side 4 enlarged lateral teeth, the first and last bicuspid, the middle ones tricuspid ..... 1. *tridentatus.*

II. Supraoral lamina bicuspid; infraoral lamina with 6 to 9 cusps.

A. On each side 4 enlarged lateral teeth, the first uni- or bicuspid, the others bicuspid ..... 2. *spadiceus.*

B. On each side 3 enlarged bicuspid lateral teeth.

Dorsal fins well separated ..... 3. *japonicus.*
Dorsal fins only separated by a notch ..... 4. *wilderi.*

1. *Entosphenus tridentatus.*

Petromyzon tridentatus, Richards. Faun. Bor.-Am. p. 293 (1836).
Ichthyomyzon tridentatus, Günth. Cat. Fish. viii. p. 506 (1870).
Ichthyomyzon astori (Girard, 1858), Günth. *l. c.*
Entosphenus tridentatus, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 12.

Pacific Coast of North America, from Unalaska to California, entering rivers.

1–2. 570–590 mm.	La Grande, Oregon.	Prof. C. H. Eigenmann.
3. 480 mm.	Walla Walla, Columbia R.	Smithsonian Inst.

2. *Entosphenus spadiceus.*

Lampetra spadicea, Bean, Proc. U.S. Nat. Mus. 1887, p. 374; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 13.

Rio Lerma, Mexico.

1. 175 mm.	Jacona, Michoachan.	Mexico Mus.
2–5. 110–155 mm. (larvæ).	„ „	„

3. *Entosphenus japonicus.*

Petromyzon japonicus, Martens, Arch. f. Nat. xxxiv. 1858, p. 3; Günth. Cat. Fish. viii. p. 504 (1870).
Lampetra japonica, Jord. & Snyd. Proc. U.S. Nat. Mus. xxiii. 1901, p. 733.

Japan; Russia.

1. 500 mm.	Echigo.	Dr. Kishinouye.
2. 400 mm.	Hokkaido.	Prof. D'Arcy Thompson.
3. 380 mm.	Tokyo.	Dr. D. S. Jordan.

Two Lampreys from Archangel, noticed by Smitt, with a figure of the dentition (Scand. Fish. p. 1191, fig. 353, 1895), have been kindly sent to me for examination by Prof. E. Lönnberg, and are in every way similar to Japanese examples of *E. japonicus*.

4. *Entosphenus wilderi.*

Petromyzon branchialis (non Linn.), Gage, Wilder Quarter Century Book, p. 436, pl. iv. and pl. vi. fig. 21 (1893).
Lampetra wilderi, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 13.

Eastern North America.

1. 150 mm.	New York.	Prof. Bashford Dean.
2. 160 mm.	Waukegan, Illinois.	Smithsonian Inst.
3–8. 120–160 mm.	Cedar Rapids, Iowa.	Field Mus.

8. Lampetra.

Petromyzon (part.), Linn. Syst. Nat. ed. 10, p. 230 (1758); Günth. Cat. Fish. viii. p. 500 (1870).
Lampetra, Gray, Chondropt. p. 143 (1851).

Differs from *Entosphenus* only in the absence of the posterior series of teeth which connect the last pair of enlarged lateral teeth in that genus.

Europe; Northern Asia; North America.

1. *Lampetra fluviatilis.*

Petromyzon fluviatilis, Linn. Syst. Nat. ed. 10, p. 230 (1758); Günth. Cat. Fish. viii. p. 502 (1870); Day, Fish. Brit. ii. p. 359, pl. clxxix. fig. 1 (1884).
Lampetra fluviatilis, Gray, Chondropt. p. 143 (1851), or Proc. Zool. Soc. 1851, p. 237, pl. iv. fig. 2; Berg, Bull. Acad. Imp. St. Petersb. (5) xxiv. 1906, p. 181.
Petromyzon plumbeus (non Shaw), Ayres, Proc. Calif. Acad. 1854, p. 28.
Petromyzon ayresii, Günth. *t. c.* p. 505.
Petromyzon ernsti, Dybowski, Verhandl. zool.-bot. Gesellsch. Wien, xxii. 1872, p. 220.

Lampetra aurea (Bean, 1881), Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 13.
Lampetra cibaria (? Girard, 1858), Jord. & Everm. *l. c.*
? *Lampetra opisthodon*, Gratzianow, Dneve. zool. otd. obsc. liub. jest. Moskva, iii. 1907, p. 18.

Supraoral lamina bicuspid; infraoral lamina with 6 to 9 more or less acutely pointed cusps. On each side 3 enlarged teeth, the first and last usually bicuspid, the middle one usually tricuspid. First dorsal separated from the second by an interspace; second dorsal triangular.

Coasts and rivers of Europe, Siberia, Kamchatka, and Western North America, from Alaska to California.

1–2, 3–5, 6, 7. 150–400 mm.	England.	
8–10. 280–320 mm.	R. Thames.	A. Smee, Esq.
11. 290 mm.	„	J. Doubleday, Esq.
12. 330 mm.	Tewkesbury.	Dr. A. Günther.
13. 210 mm.	Devonshire.	Mus. Leach.
14–18. 220–400 mm.	Holland.	
19–21. 150–230 mm.	Belgium.	Prof. van Beneden.
22. 130 mm. (incompletely metamorphosed).	Bavaria.	Prof. von Siebold.
23. 300 mm.	R. Narowa.	St. Petersburg Mus.
24. 210 mm.	N. America.	
25. 170 mm.	Russian R., California.	

2. *Lampetra planeri.*

Petromyzon planeri, Bloch, Fisch. Deutschl. iii. p. 47 (1782).
Petromyzon branchialis (? Linn.), Günth. Cat. Fish. viii. p. 504 (1870); Day, Fish. Brit. ii. p. 362, pl. clxxix. figs. 2–3 (1884).
Lampetra planeri, Gray, Chondropt. p. 144 (1851); Berg, Bull. Acad. Imp. St. Petersburg, (5) xxiv. 1906, p. 181.
Petromyzon reissneri, Dybowski, Verhand. zool.-bot. Gesellsch. Wien, xix. 1869, p. 958.
Lampetra mitsukurii, Hatta, Annot. Zool. Japon. iv. 1901, no. 1, p. 24; Jord. & Snyd. Proc. U.S. Nat. Mus. xxiii. 1901, p. 734.

Supraoral lamina bicuspid, sometimes tricuspid; infraoral lamina with 6 to 9 obtuse cusps. On each side 3 enlarged teeth, the first and third usually bicuspid, the middle one bi- or tricuspid. First dorsal contiguous to or continuous with the second, separated from it by a notch; second dorsal with convex free edge.

Europe; Siberia; Japan.

1–2. 110–115 mm.	Belfast.	R. Patterson, Esq.
3–7. 120–140 mm.	Firth of Forth.	Dr. Parnell.
8–17. 110–140 mm.	Hawksfold, Sussex.	O. Salvin, Esq.
18–27. 110–150 mm. (4 adults, 4 larvæ, and 3 intermediate specimens).	Berlin.	Berlin Mus.
28–29. 150–165 mm.	Tauber, Würtemburg.	Stuttgart Coll.

30. 120 mm.	Onon R.	Godeffroy Mus.
31–32. 100–105 mm.	Inland Sea of Japan.	R. Gordon Smith, Esq.
33–42. 80–100 mm	Gifu, Mino Prov., Japan.	Prof. Mitsukuri.

Ammocœtes branchialis, Linn.

Under this name may be placed a number of larvæ, most of which probably pertain to *Lampetra*, but some to other Petromyzonids.

1.	Tweed.	
2.	Eaton.	Leach Coll.
3–6.	R. Enz, Würtemburg.	Stuttgart Coll.
7.	R. Blau, „	„
8–17.	Bavaria.	Dr. Gemminger.
18–19.	Sardinia.	Prof. Bonelli.
20–21.	L. Garda.	Dr. Werner.
22–31.	L. Biwa, Japan.	Mr. Sugubi.
32–41.	British Columbia.	Boundary Commission.

XIX.— *On the Systematic Position of* Macristium chavesi.

By C. Tate Regan, M.A.

In 1903 (Ann. & Mag. Nat. Hist. (7) xii. p. 345) I described a remarkable fish from the Azores, to which I gave the name *Macristium chavesi*. Recently, when working at the osteology and classification of the Iniomi, it seemed to me desirable to re-examine this fish; I accordingly wrote to Major F. A. Chaves, who has kindly sent me the specimen.

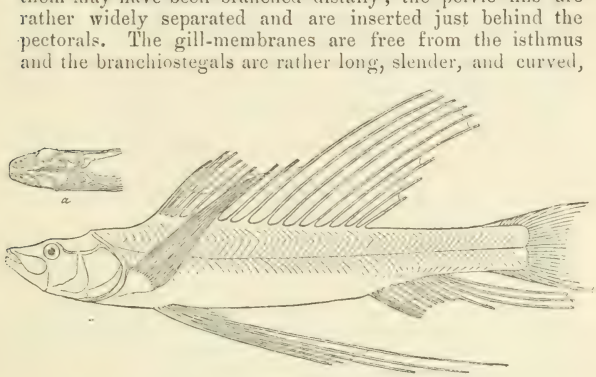
The type of *Macristium chavesi* measures 110 mm. to the base of the caudal fin; it has been a good deal damaged, and in the absence of precise information I should judge that it may have been washed ashore. The snout and the end of the lower jaw are injured and the præmaxillaries have been lost; one of the pectoral fins is complete, but none of the other fins has even a single ray entire.

Originally I believed that *Macristium* was related to *Bathysaurus*, Günth., which it resembles in the position of the fins and the number of rays. I am now of the opinion that this resemblance is misleading, for I think that in all probability the præmaxillaries would not exclude the maxillaries from the gape. In any case, *Macristium* must be made the type of a distinct family, Macristiidæ, probably related to the Alepocephalidæ.

Before returning the fish to the Ponta Delgada Museum it seems to me best to make a figure of it and to reinforce my original description.

The body is elongate, moderately compressed, naked; the

abdomen seems to be very distensible and the vent is situated just in front of the anal fin. The myotomes number about 62. The caudal fin has 19 principal rays and there are 18 rays in the dorsal fin, 12 in the anal, 16 in the pectoral, and 8 in the pelvic; all the rays of the dorsal, anal, and pelvic fins appear to be very elongate and unbranched, but some of them may have been branched distally; the pelvic fins are rather widely separated and are inserted just behind the pectorals. The gill-membranes are free from the isthmus and the branchiostegals are rather long, slender, and curved,



Macristium chavesi (slightly reduced). *a*, head from above.

about 8 in number on each side; there are 4 gills and no pseudobranchiæ. Small acutely pointed teeth are present in the lower jaw and on the vomer, palatines, and tongue; the maxillary is broad, rounded posteriorly, without supramaxillary. There are two nostrils on each side which are superior rather than lateral in position and lie near the end of the snout in front of the anterior end of what appears to be an elongate supraorbital bone; the head is flattish above and the frontals are slightly raised above each eye. The post-temporals approach each other rather closely in the occipital region.

XX.—*New Asiatic* Muridæ. By Oldfield Thomas.

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Epimys whiteheadi perlutus, subsp. n.

Essential characters of true *whiteheadi*, but with larger skull and greyish belly.

General colour above of the same mixture of buffy and grey, lined with blackish, as in *whiteheadi*. Under surface (instead of being more or less buffy ochraceous) clear pale grey, near "lavender-grey," fairly well defined laterally; some specimens, however, with a faint buffy wash along the centre of the chest and abdomen.

Skull, compared with that of true *whiteheadi*, larger throughout, and the brain-case broader. Frontal region concave, the supraorbital and parietal ridges strongly marked. Palatal foramina very short.

Dimensions of the type :—

Head and body 130 mm.; tail 120; hind foot 29·7.

Skull: greatest length 35·5; basilar length 28·2; zygomatic breadth 15·5; nasals 11·7; interorbital breadth 5·7; breadth across parietal ridges 14·3; palatilar length 14; diastema 9; palatal foramina 4·5 × 2·4; upper molar series 5·8.

Hab. Balangean, Northern Central Sarawak.

Type. Old female. B.M. no. 11. 1. 19. 2. Original number 27. Collected 3rd July, 1910. Presented by the Sarawak Museum. Five specimens examined.

This would seem to be a larger pale-bellied form of the Kina-Balu *E. whiteheadi*, a species which, curiously enough, has not as yet turned up in the intermediate region of Baram, so well worked by Messrs. Hose and Everett.

I owe the opportunity of describing this rat to the kindness of Mr. J. C. Moulton, of the Sarawak Museum, who has sent to the British Museum a small collection of Muridæ from Balangean for determination.

Chiropodomys legatus, sp. n.

Like *Ch. major*, but larger.

External characters much as in *major*, but size larger. Fur rather longer and softer; hairs of back about 7·5 mm. in length. Colour above of the same greyish fawn; under surface pure sharply defined white. Hands and feet dull whitish, with but little darkening on the metatarsals. Tail longer than in *major*, rather less heavily tufted.

Skull longer than that of *Ch. major*, rather less broad in proportion. Supraorbital ledges well developed. Nasals not projected anteriorly in front of gnathion. Palatal foramina decidedly longer than in *major*.

Dimensions of the type (measured in skin) :—

Head and body 133 mm.; tail 152; hind foot (wet) 24·5; ear (wet) 16.

Skull: tip of nasals to front corner of interparietal 28; henselion to basilar suture 22; zygomatic breadth 17·2;

length of nasals 11; interorbital breadth 5·5; breadth of brain-case 14·8; palatilar length 15; diastema 9·8; palatal foramina 5; length of upper molar series 4·9.

Hab. Mt. Kina Balu, N. Borneo. Type from "above Pinokok."

Type. Adult male. B.M. no. 93. 4. 1. 21. Collected October 1892 by A. Everett.

This is the largest *Chiropodomys* yet discovered. It differs from its ally *Ch. major* by its larger size, longer tail, and longer palatal foramina. The abbreviation of the nasals anteriorly is also worthy of note, the same character occurring in the next species, while the nasals of *Ch. major* are as in ordinary Murines.

Chiropodomys pictor, sp. n.

Rather smaller than *Ch. major*.

Size about as much smaller than in *Ch. major* as it is larger in *Ch. legatus*. Fur soft and close; hairs of back about 6 mm. in length. General colour above greyish fawn, rather paler on the sides. Under surface pure sharply defined creamy white. Eyes with dark rings. Ears brown. Hands and feet silvery whitish, a narrow dark patch along the middle of the metatarsals. Tail uniformly dark brown as usual; heavily tufted terminally.

Skull with broad rounded brain-case, much bowed in upper profile. Nasals not reaching forward to the level of gnathion. Palatal foramina short.

Dimensions of the type (measured in skin) :—

Head and body (c.) 120 mm.; tail 120; hind foot (wet) 20·5; ear (wet) 16.

Skull: tip of nasals to front corner of interparietal 24·5; henselion to basilar suture 18·6; zygomatic breadth 16·5; length of nasals 8·8; interorbital breadth 5·3; breadth of brain-case 14; palatilar length 12·8; diastema 8·2; palatine foramina 3·7; upper molar series 4.

A perfect skull taken from a spirit-specimen is 27·6 mm. in total length; basilar length 21·7.

Hab. Mt. Kina Balu, N. Borneo.

Type. Adult male. B.M. no. 94. 7. 2. 43. Collected January 1894 by A. Everett.

Hæromys, gen. nov.

Like *Chiropodomys* in shape of skull and prehensile character of feet, but the molars of the general *Mus-Epimys*

type, without postero-internal cusp (cusp 7 or *x* cusp), the laminæ simple, not corrugated.

Type. *H. margarettæ* (*Mus margarettæ*, Thos.).

Other species:—*H. pusillus* (*Mus margarettæ pusillus*, Thos., 1893) and *H. minahassæ*, Thos.

This genus, whose peculiarities have been already fully detailed in the descriptions of the species, seems to bear in Borneo to *Chiropodomys* something of the same sort of relationship that in Africa the *Thamnomys*-like mice do to true *Thamnomys*; but the difference between the two is greater and more sharply defined, and the generic distinction of *Hæromys* from *Epimys* indubitable.

The asserted resemblance of the feet of *H. minahassæ* to those of "*Mus*," as given in the original description, seems to have been due to the specimen being a dried skin, so that their structure could not be easily made out. They appear to be much the same as in *H. margarettæ*.

Uromys obiensis, sp. n.

A medium-sized species, with white belly.

Size rather less than in *U. bruijnii*. Fur thick, soft, and woolly; wool-hairs of back about 11 mm. in length. General colour above dark clay-colour, more tawny on crown and rump, clearer and more buffy on sides. Under surface and inner sides of limbs pure white to the bases of the hairs, but the white area somewhat narrowed on the belly. Face greyish brown. Ears short, naked, dull brown. Hands and feet thinly haired, almost naked, white or flesh-coloured. Tail rather long in proportion, dark brown, a few fine scattered bristles upon it; rings of scales about 14 to the centimetre.

Skull of about normal height; supraorbital edges little developed. Palatal foramina unusually prolonged backwards, their posterior end almost level with the front of the anterior root of m^1.

Dimensions of the type (measured in skin):—

Head and body 142 mm.; tail 154; hind foot (wet) 28; ear (wet) 14.

Skull: nasals 11·3; interorbital breadth 5·6; height from supraorbital ledge to alveolus of m^2 9·3; palatilar length 16; diastema 9·2; palatal foramina 6·1; length of upper molar series 6·4.

Hab. Obi Island.

Type. Adult female. B.M. no. 3. 4. 10. 1. Collected 29th April, 1902, by Mr. Waterstradt.

This species represents the farthest western extension of

the genus *Uromys*, its nearest neighbour being the somewhat larger *U. bruijnii* of Salawatti.

Microtus (*Eothenomys*) *melanogaster colurnus*, subsp. n.

Similar in all essential characters to true *melanogaster*, but much brighter in colour, the type form being something between "bistre" and "mummy-brown," while the present animal is rather darker and richer than "hazel." The tail also seems to average shorter, but properly measured series are not at present available.

Dimensions of the type (measured in skin) :—

Head and body 110 mm. ; tail 35 ; hind foot 17·5.

Skull : condylo-basal length 26·2.

Hab. Kuatun, N.W. Fokien.

Type. Adult male. B.M. no. 0. 5. 8. 38. Original number 52. Collected 24th October, 1899, and presented by C. B. Rickett, Esq.

A large number of specimens examined, presented by Messrs. C. B. Rickett, F. W. Styan, and J. de La Touche.

Plecotus wardi, sp. n.

A pale-coloured species with large skull.

Size large. Fur very long and fine. General colour pale, paler than "drab-grey ;" under surface broadly washed with greyish white (grey no. 10), lighter than in any other form. Thumb long.

Skull broad and rounded. Bullæ large.

Dimensions of type :—

Forearm 45·5 mm.

Head and body 53 ; tail 50 ; ear 41 ; thumb, c. u. (exclusive of metacarpal) 7·8 ; lower leg and foot (c. u.) 29·5.

Skull : condylo-basal length 16·6 ; basi-sinual length 13·1 ; greatest horizontal diameter of bulla 4·4.

Hab. Leh, Ladak. Alt. 10,500′.

Type. Adult female. B.M. no. 6. 10. 3. 2. Original number 73. Collected 10th June, 1906, by C. A. Crump. Presented by Col. A. E. Ward.

Distinguishable from *P. homochrous* and *puck* by the broader skull and paler colour.

Named in honour of the donor, to whom the Museum is indebted for valuable series of Kashmir animals.

XXI.—*Description of a new Genus of Molossine Bats from West Africa.* By Guy Dollman, B.A.

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Among a collection of West-African mammals recently presented to the British Museum by Dr. H. G. F. Spurrell is a bat representing a new genus of the family Molossidæ.

Xiphonycteris, gen. nov.

Size similar to that of the smaller species of *Nyctinomus*. Wings small, membranous area much reduced. Ears, feet, and tail much as in *Nyctinomus*.

Skull with median anterior palatal emargination like that of *Nyctinomus*, but emargination quite small and inconspicuous, though extending behind roots of incisors. Teeth according to the following formula:—

$$i.\ \frac{1-1}{1-1},\ c.\ \frac{1-1}{1-1},\ p.\ \frac{2-2}{2-2},\ m.\ \frac{3-3}{3-3}=28.$$

Upper incisors quite small and closely in contact with canines; widely separated from each other, wider apart at base than at tip. Upper canine rather similar to that of *Nyctinomus*, but with cingulum very prominent and shaft of tooth longer, much flatter anteriorly, and pointing slightly outwards. Base of canines much enlarged, the anterior edges of the cingula on a level with the anterior limit of the upper incisors; when looked at from above the cingula appear as two prominent crescentic ridges with the minute incisors between them, the incisors being so placed as to resemble two antero-internal cusps on the cingula of the canines. Behind the shaft the cingulum is expanded to form a large flat area, its posterior edge closely in contact with the small anterior premolars. Upper premolars and molars as in *Nyctinomus*, the molars with well-developed hypocones. Lower incisors reduced to a single pair of very minute functionless teeth, bridged over by the junction of the lower canines; cutting-edges deeply bifid. Lower canines with well-developed cingula, forming anteriorly prominent secondary cusps, which meet together in the mid-line as a bridge over the minute incisors; posterior portion of cingulum large and well developed, much more so than in the allied genera. Lower molars and premolars as in *Nyctinomus*.

Type, *Xiphonycteris spurrelli*.

This genus would appear to be most nearly related to the

genus *Nyctinomus*, which it resembles in general external characters and in the presence of the small upper premolar; but the absence of i_2, the peculiar position of the single pair of minute lower incisors, and the unusual shape and arrangement of the upper and lower canines are more than sufficient reasons for considering the genera as quite distinct. As regards the genus *Chærephon* the same differences hold good, with the additional character of the median anterior palatal emargination present in *Xiphonycteris*.

In the possession of only a single pair of lower incisors, and in having the lower canines in contact with one another, this genus in some ways resembles the South-American genus *Molossops*; but the two genera, on account of numerous important differences, cannot be looked upon as close allies.

Xiphonycteris spurrelli, sp. n.

General appearance and size much as in the smaller species of *Nyctinomus*. Ears roughly triangular in shape, with rounded corners; tragus and antitragus apparently normal. Feet comparatively small; toes hairy, the hairs extending along the margin of the interfemoral membrane for about 10 mm. Wings small, forearm only 27 mm. long; wing-membrane very narrow. Hair on back short, a few longer hairs near base of tail. General colour of back rusty red, hairs rather lighter at base than at tips. Under surface of body buffy white, the hairs becoming brownish on the flanks and sides of neck. Tail, as described above, with terminal half free. Interfemoral membrane naked on upper surface, below thinly clad with very minute white hairs.

Skull with rather narrow brain-case, markedly so in the occipital region. Supraoccipital crest well developed, extending back some distance beyond the exoccipital region. Sagittal crest but little developed. Zygoma fairly strong, expanded posteriorly. Anteorbital foramen large. Lachrymal ridge faintly indicated. Anterior palatal emargination about as large as base of upper incisor, extending well behind the roots of incisors. Palate slightly arched laterally, nearly flat antero-posteriorly; pterygoids almost parallel, slightly divergent behind; basisphenoid pits moderately developed. Auditory bullæ small and rather flat.

Teeth as described above.

Dimensions of the type (measured in flesh) :—

Head and body 56 mm.; tail 24; hind foot 8; ear 13; forearm 27.

Skull: greatest length 17; basilar length 12·2; condylo-basilar length 14; greatest zygomatic breadth 10; inter-

orbital breadth 3·5; breadth of brain-case (across squamosal region) 8·6; breadth of rostrum (across lachrymal region) 6; palatilar length 5·8; width of palate inside m^2 3·3; width across palate outside m^2 7; postpalatal length 6·5; length of upper tooth-row from front of canine to back of m^3 6·4; length of upper tooth-row from front of first premolar to back of m^3 4·9; height of canine 3·2.

Hab. Bibianaha, 60 miles W. of Kumasi, Gold Coast. Altitude 700 feet.

Type. Adult male. B.M. no. 11. 1. 11. 1. Original number 34. Collected on December 8th, 1910, by the donor, Dr. H. G. F. Spurrell.

It gives me great pleasure to associate this new and interesting bat with the name of Dr. Spurrell, to whom the National Collection is already indebted for many rare and unique West-African mammals.

XXII.—*Descriptions of Three new Characinid Fishes from South-western Colombia.* By G. A. Boulenger, F.R.S.

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Lebiasina multimaculata.

Depth of body $4\frac{1}{2}$ to 5 times in total length, length of head 4 to $4\frac{1}{4}$ times. Eye 3 (young) to 4 times in length of head, as long as snout in adult; interorbital width $2\frac{1}{2}$ times; maxillary extending to below anterior third of eye. Dorsal II 8, about $1\frac{2}{3}$ times as distant from end of snout as from root of caudal. Anal III 8. Pectoral $\frac{2}{3}$ length of head. Caudal deeply notched. Caudal peduncle a little longer than deep. Scales 28–29 in a longitudinal series, 18 round the body; lateral line reduced to the 4 anterior scales. Dark brown above, whitish beneath; 9 to 11 roundish black spots along each side, the last at root of caudal; a blackish band on the anal.

Total length 100 mm.

Three specimens from the Condoto River at Condoto, Choco, 150 ft., from the collection of Mr. M. G. Palmer. These types and the following preserved in the British Museum.

Luciocharax striatus.

Depth of body $6\frac{1}{2}$ times in total length, length of head nearly 3 times. Snout longer than postocular part of head, 4 times diameter of eye, which is $1\frac{1}{2}$ times in interorbital

width ; maxillary extending to below posterior border of eye. Gill-rakers rather long and slender, 12 on lower part of anterior arch. Dorsal II 8, $2\frac{1}{2}$ times as distant from head or from root of caudal. Anal III 8, originating below middle of dorsal. Pectoral $\frac{2}{3}$ length of head. Caudal deeply notched. Caudal peduncle twice as long as deep. Scales 48 $\frac{7-9}{6-7}$, $3\frac{1}{2}$ between lateral line and ventral ; lateral scales with 16 to 18 radiating strong keels terminating in spines ; lateral line 30. Olive-brown above, whitish on the sides, with five olive-brown longitudinal streaks running between the series of scales, silvery white beneath ; a large black ocellar spot, edged with yellow, at the root of the caudal ; dorsal and caudal greyish, other fins whitish.

Total length 200 mm.

A single specimen from Boca de Calima, Choco, 5200 ft., from the collection of Mr. M. G. Palmer.

Curimatus lineopunctatus.

Depth of body $2\frac{1}{3}$ to $2\frac{2}{3}$ times in total length, length of head 4 times. Head nearly twice as long as deep, upper profile scarcely concave at occiput ; eye a little longer than snout, a little shorter than interorbital width, 3 times in length of head ; adipose eyelid rudimentary. Gill-rakers short, 16 or 17 on lower part of anterior arch. Dorsal III 9, its origin nearer end of snout than root of caudal. Anal III 7. Pectoral $\frac{3}{4}$ length of head, not reaching ventral. Belly not keeled behind the ventrals. Caudal deeply forked, a little longer than head. Caudal peduncle as long as deep. Scales 40–42 $\frac{8-9}{7}$, 6–7 between lateral line and ventral. Steel-grey above, silvery white beneath, the scales on the sides with round black spots forming regular longitudinal series ; a large round black blotch on the caudal peduncle.

Total length 135 mm.

Five specimens from Novita, Rio Tamana, Choco, 150–200 ft., from the collection of Mr. M. G. Palmer.

XXIII.—*Entomological Notes from the London School of Tropical Medicine.*—No. I. *Description of a new Species of* Tabanidæ *from British Guiana.* By Sophia L. M. Summers, M.A., B.Sc.*

The species described below is near *Dichelacera testacea*, Macq., which, as Miss Ricardo states, has not the typical

* Communicated by Lt.-Colonel A. Alcock, C.I.E., F.R.S.

colouring and shape of the other species of the genus as she restricts it. It is much larger than *D. testacea*, measuring 19 mm. Its wings are smoky and blotched, whereas in *D. testacea* the wings are hyaline all except three dark spots. The tibia of the fore leg is white, but in *D. testacea* it is black. The abdomen is dark brown, in *D. testacea* a rusty brown.

Dichelacera robiginosa, sp. n.

Head broader than the thorax, front and face orange-yellow. Eyes large, black with a bronze shimmer, bare. Frontal callus a narrow stripe, hardly widening at the base. First two joints of the antennæ reddish orange, third joint reddish brown, its spur reaching to the second annulation and sparsely beset with small bristles on its dorsal surface. First three annulations of the third joint dark brown, fourth almost black. Palps about as long as antennæ, yellow, curved, rather thinly tomentose. Proboscis long, brown, blackish at the tip.

Thorax and scutellum rusty brown, under surface light brown.

Legs: all the femora reddish yellow, as also are the tibia and greater part of the first tarsal joint of the second and third legs. Tibia of the first leg whitish in its proximal two-thirds, dark cinnamon-brown in its distal third. All the tarsal segments of the first legs nearly black, the last four tarsal segments of the second and third legs dark brown.

Wings much clouded, the veins very dark. Costal cell smoky yellow. Between the subcostal and the fifth longitudinal veins the wing is blotchy and smoky, but the greater part of the discal and of the fifth posterior cells and a part of the fourth posterior cell are transparent, and the greater part of the second basal as well as a distal patch in the marginal and second submarginal cells and two narrow streaks in the first submarginal cell are translucent. The smoky blotches are darkest at the tip of the first longitudinal vein and its neighbourhood, round the anterior cross-vein and its neighbourhood, at the bifurcation of the third longitudinal vein, and at the tip of the discal cell.

Abdomen dark brown, each segment from the second to the fifth inclusive with a well-defined median triangular yellow patch. Under surface light brown.

The specimen that constitutes the type of this species was sent to the London School of Tropical Medicine by Dr. K. S. Wise, Government Medical Officer, Georgetown, Demerara,

and will be placed at the disposal of the British Museum. Dr. Wise has also sent specimens of the same species to the British Museum direct, and these—thanks to the kindness of Mr. E. E. Austen, whose ungrudging assistance in other ways I have also to acknowledge—have been compared in formulating the description of the species.

XXIV.—*Description of Two new Tetragonopterid Fishes in the British Museum.* By Prof. C. H. Eigenmann.

During a visit to the British Museum to examine types of South-American freshwater fishes Mr. G. A. Boulenger referred the following new material to me for identification.

Nematobrycon, gen. nov.

Caudal three-pronged, the middle two rays nearly as long as, or even longer than, the outer rays, which are prolonged, filiform. Lateral line incomplete; no adipose fin; premaxillary teeth multicuspid, in two series; maxillary with large conical teeth along nearly its entire length; caudal naked.

A Tetragonopterid genus distinguished from all other genera of the subfamily by the absence of an adipose fin and the filamentous three lobes of the caudal.

Nematobrycon palmeri, sp. n.

Several specimens, 8–20 mm., from Condoto, Rio Condoto, and Novita, Rio Tamana, S.W. Colombia. Collected by Mr. M. G. Palmer. British Museum.

Head 4·2; depth 2·66; D. 10 or 11; A. 29–31. Scales 7—7 + 26—5. Eye 3 in head, ·5–·75 in snout, about equal to interorbital.

Compressed, resembling *Crenuchus* and *Pœcilocharax* in general appearance and the absence of an adipose fin; dorsal and ventral profiles nearly equally arched; highest point of dorsal profile at origin of dorsal fin; ventral profile regularly arched; predorsal area with a median series of about seven scales; preventral area narrowly rounded; occipital process with three scales on each side, the process about one-fifth as long as its distance from its base to the dorsal; frontal fontanel minute; interorbital moderately convex; second suborbital heavy, convex, in contact with the preopercle

below; mouth oblique, jaws equal; maxillary equal to snout and one-third or one-half of the eye; premaxillary with three teeth in the outer series, four in the inner, about eleven teeth on the maxillary; mandible with four large teeth in front and minute ones on the side.

Scales regularly arranged, no interpolated scales over the anal; a basal sheath of scales on anal and caudal, these fins otherwise naked; few or no radial striæ.

Origin of dorsal fin about equidistant from snout and middle caudal rays; highest dorsal ray about 2 in the length; in adult male the outer and middle caudal rays are produced in filaments about half as long as the body. Anal long, slightly emarginate in front, its origin equidistant from base of the middle caudal rays and the middle or end of the eye; ventrals reaching beyond origin of the anal; pectorals to or beyond origin of anal.

(In formalin) a broad black band from the eye down and to the lower half of the caudal, margined above by a light line, fading out downwards. Upper surface coppery in life (?); dorsal filament, outer caudal filament, middle caudal rays and filament, and submarginal anal band black; margin of anal hyaline. The dark lateral band most intense in Novita specimens.

Knodus meridæ, sp. n.

A specimen 53 mm. Merida, Venezuela. C. M. Briceno. British Museum.

Head 4; depth 4; D. 10; A. 16. Scales 4—33—2. Eye 3·25 in the head, about ·8 in snout, 1·25 in the interorbital.

Basal half of caudal scaled. Slender, dorsal and ventral profiles scarcely arched. Snout short, blunt. Second suborbital covering the entire cheek, without a naked angle below its anterior corner. Maxillary 2 in snout and eye. Occipital process about one-eighth the distance of its base from the dorsal. Five teeth in outer row of premaxillary, the second retreated from the line; four teeth in inner series of premaxillary; maxillary with 3 broad multicuspid teeth; mandible with 8 graduated teeth. Two scales between lateral line and anal; each scale of sides with numerous radii; bases of anal and caudal with large scales. First dorsal a little nearer to snout than to the base of middle caudal rays, the highest ray a little more than 5 in the length. Upper caudal lobe nearly 5 in the length, the lower slightly shorter. Anal scarcely emarginate; ventrals reaching to anal; pectorals not quite to ventrals.

A broad silvery band tapering on the caudal peduncle, continued to end of middle caudal rays. No humeral or caudal spots.

XXV.—*Scorpions and Solifugæ collected by Captain S. S. Flower in the Anglo-Egyptian Sudan.* By S. Hirst.

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Scorpions.

Buthus citrinus, H. & E.

Loc. Wady Halfa.

Buthus acutecarinatus, Sim.

Loc. Khartoum and the Senaar Province; in the British Museum collection there are present also examples from Atbara (*Dr. S. K. Malouf*), and from Thebes and Ghizeh (*S. S. F.*) in Egypt.

Buthus minax, L. Koch.

Loc. Captain Flower collected examples of this species at Khartoum; the mouth of the Pinder River; Senaar and Roseires. There are also specimens in the British Museum collection from Abyssinia.

Remarks.—The male of *Buthus* * *minax* differs from that of *B. emini*, Poc., principally in the structure of the tail, the upper keels of which are very much weaker, the lateral ones being exceedingly weak or absent in segments 2–4; moreover, the upper keel of the fifth caudal segment is represented by only a very short series of granules and the intercarinal spaces of the caudal segments are not nearly so strongly granular as is the case in *B. emini*.

In the male of *B. emini*, on the other hand, segments 1–4 of the tail are each furnished with ten well-defined granular keels, the upper and lateral keels being quite distinct and composed of separate granules, which show no tendency to fuse with one another; the fifth caudal segment has a well-marked upper keel, which runs the entire length of the segment.

[*Buthus polystictus*, Poc., is very closely allied to *B. minax* and *B. emini*, and Prof. Kraepelin † believes that it is only

* Birula's observations on *Buthus minax* and its allies (Sitz. Ber. Ak. Wiss. cxvii. p. 141, 1908) should be consulted.

† Zool. Jahrb. (Syst.) xviii. p. 560 (1903).

a variety of the latter. I think that it is undoubtedly more closely allied to *B. emini* than to *B. minax*, but that it should be regarded as a distinct species and not merely as a variety. The male can be readily distinguished from that of *B. emini* by its much narrower hand, which is only slightly broader than the brachium, and longer and more slender fingers; moreover, the movable finger has only a very slight low lobation, and the immovable finger is without any definite lobe. The hand and fingers, indeed, are very similar in shape in both sexes in *B. polystictus* and resemble closely those of the female of *B. emini*. In the male of *B. emini*, however, the hand is very much broader than the brachium, and the fingers are very different in shape to those of the female; they are shorter and stouter, and both the movable one and the immovable one in the adult are furnished with very distinct lobes, that of the immovable finger being especially strong. In addition to the specimens of *B. polystictus* determined by Mr. Pocock, I have examined sixteen males and forty-three females and young from Berbera, and eleven males and twenty-two females from the Wagar Mountains behind Berbera; these specimens were collected by Mr. G. W. Bury.]

Buthus quinquestriatus, H. & E.

Loc. Captain Flower collected examples of this well-known species at Wady Halfa, Khartoum, and the Blue Nile.

[A specimen of the following species from the Sudan has been acquired by the Trustees of the British Museum.]

Parabuthus liosoma hunteri, Poc.

Parabuthus hunteri, Poc. J. Linn. Soc., Zool. xxv. p. 309 (1895).

Additional Loc. Omdurman, Sudan. A large male example collected by Capt. H. N. Dunn, R.A.M.C.

Measurements of this specimen in mm.—Total length 99; length of carapace 11·5, of fifth caudal segment 12·5; width of fifth caudal segment 7·25.

Remarks.—This scorpion was described from specimens obtained at Duroor and Suakin. As pointed out by Mr. Pocock, it can be distinguished from *Parabuthus liosoma* [typical form] by the greater slenderness of the tail and by the presence of a basal tubercle on the fingers of the hand, &c. It must be noted, however, that the width of the tail varies somewhat even in specimens from the same locality.

The example from Omdurman has a more slender tail than any of the original specimens.

Pandinus exitialis, Poc.

Scorpio exitialis, Poc. Ann. & Mag. Nat. Hist. (6) ii. p. 249 (1888).
Pandinus exitialis, Krpln. Das Tierr. Scorp. &c. p. 119 (1899); Krpln. Zool. Jahrb. (Syst.) xviii. p. 567 (1903).

Loc. Abu Haraz, Blue Nile (*Capt. S. S. Flower*) ; a small male example measuring 85 mm. in length.

Remarks.—This example from the Blue Nile is a slight variety of *P. exitialis.* The granulation of the under surface of the humerus of the palp is very weak, except at the edges. Four complete keels and a short inner keel are present on the dorsal surface of the hand, and the tubercles are confluent in places, but not nearly to the same extent as in the variety, which I describe below under the name *sudanicus.*

In his account of *P. exitialis,* Mr. Pocock says that there is a single dry specimen from Schoa in the British Museum collection. There are present, however, in the collection, three dry examples (co-types) of this species, all of which were collected by Sir W. C. Harris at Schoa. Four complete keels are distinctly visible on the hand of one of these specimens, and traces of these keels can be seen in the other two and in the variety from Gebel Mel.

[Var. *sudanicus,* var. nov.

This variety may be compared with the typical form of the species (from Schoa) as follows:—Dorsal surface of the hand much smoother, nearly the entire surface of the lobe being furnished with low anastomosing ridges instead of isolated tubercles (these ridges are smaller and narrower than those of *P. gregoryi,* and they are finely, but distinctly, punctured as in that species) ; the keels on the under surface of the hand are more sparsely and weakly granular than in the typical form. Proximal half of the under side of the humerus granular as in the typical form. Tarsal lobes of posterior legs with three spines, which are arranged in the same way as in the typical *P. exitialis;* the total number of spines on the anterior side of the tarsus is four, and the total number on the posterior side six or seven. Pectinal teeth twenty-one or twenty-two in number. Last abdominal sternite without any trace of keels.

Measurements in mm.—Total length 111 ; length of carapace 18.

Loc. Gebel Mel, 12 miles south of Obeid, Sudan ; a single female example captured by Capt. H. N. Dunn, R.A.M.C.]

SOLIFUGÆ.

Galeodes arabs, C. L. Koch.

Loc. Wady Halfa (*Surgeon-Major Penton and Capt. S. S. Flower*); Omdurman and Khartoum (*Capt. S. S. Flower*). The Museum possesses also examples from the Nabardi Mines (Sudan), from the White Nile, and from a number of places in Egypt.

Remarks.—A large male specimen (in spirit) collected by Capt. Flower at Wady Halfa differs from all others of this species, which I have seen, in having the spinal armature of the tarsi of both the legs of the third pair | 2+2+2 | 2 | instead of | 1+2+2 | 2 | . The armature of the legs of the second pair is, as usual, | 1+2+2 | 2 | . In all other details both of colour and structure this specimen agrees with some quite typical specimens of *G. arabs* from the same locality. The young example from Shendy, Sudan, which was determined by Dr. Tullgren * as *G. araneoides*, Pallas, is, perhaps, only an aberration of *G. arabs*, similar to this one from Wady Halfa.

OTHOES, gen. nov.

Patella and tibia of maxillipalp (of female) without either spines or bristles. Legs long and slender; the tarsus of the first leg apparently without claws and furnished at the end with a dense scopula of fine hairs, which are forked at their extremities. Tarsi of second and third legs with the spinal

Fig. 1. Fig. 2.

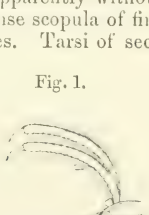


Fig. 1.—*Galeodes arabs*, C. L. Koch, side view of claws of fourth leg.
Fig. 2.—*Othoes floweri*, gen. et sp. n. „ „ „

armature | 1+1+2+2 | 2(1) | ; as will be seen from this formula, an additional unpaired spine is present on the proximal segment, the spines on the anterior side of this segment being four in number (two of which are unpaired),

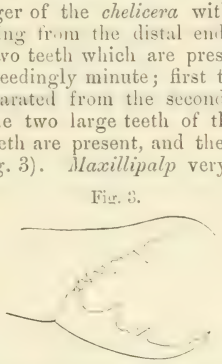
* In Jägerskiöld's 'Results of the Swedish Zoological Expedition to Egypt, 1901,' Uppsala, pt. 3, no. 21 A, p. 1 (1909).

and those on the posterior side only two in number. *Claws of the second, third, and fourth pairs of legs much longer than in Galeodes*, those of the legs of the fourth pair being the longest (fig. 1 and fig. 2).

Othoes floweri, sp. n.

Immovable finger of the *chelicera* with the second and fifth teeth (counting from the distal end) the largest; the posterior of the two teeth which are present between these major teeth is exceedingly minute; first tooth of the row of large size and separated from the second by a fairly large gap. Between the two large teeth of the movable finger, also, two minor teeth are present, and the posterior of them is very minute (fig. 3). *Maxillipalp* very long and slender,

Fig. 3.



Othoes floweri, gen. et sp. n., chelicera from the inner side.

and its femur is furnished below, on the inner side, with a row of about five or six fairly strong spines and also with weaker spines; patella and tibia without either thorns or bristles, the latter narrowed distally; tarsus freely movable and more slender and not so abruptly narrowed as is the case in the species of *Galeodes*—moreover, it is furnished with a scopula composed of forked hairs, similar to those at the end of the tarsus of the first leg. Handles of the maleoli about equal in length to or a little less than the greatest length of the blades. Metatarsus of fourth leg with the spinal armature $(1+1)+1+2+2$, but the proximal unpaired spines (enclosed in brackets in the formula) are much weaker than the others. The spinal armature of the tarsus of the fourth leg is | 2+2+2 | 2 | 0 | .

Colour.—Body, cheliceræ, and legs pale yellow; a fine blackish line is present, however, along the anterior margin of the head-plate, and the ocular tubercle is also black, but it has an ill-defined longitudinal yellowish streak in the middle. Patella and tibia of maxillipalp black and the tarsus slightly darkened; the basal segments of this appendage are pale yellow.

Measurements in mm.—Length of body 22·5; greatest breadth of anterior margin of head-plate 5·75; length of chelicera 9, of palp (excluding the coxa) 29·75, of patella of palp 11, of tibia of palp 6·75, of tarsus of palp 2, of fourth leg 44·5.

Loc. Wady Halfa; a single female specimen, collected by Capt. S. S. Flower.

Dæsia sp.

Loc. Khartoum and the Blue Nile; owing to the absence of the male, I have not ventured to determine this species.

BIBLIOGRAPHICAL NOTICE.

Catalogue of the Lepidoptera Phalænæ in the British Museum. Vol. X. *Noctuidæ*. By Sir George F. Hampson, Bart. London: Printed by Order of the Trustees, 1910. Price 20*s*. 8vo. Pp. xix, 829.

It will hardly be disputed that Sir George F. Hampson is one of the most energetic and hard-working of living Entomologists, when we consider that this huge volume, the thickest of the whole series, was published at the end of the same year, the beginning of which saw the appearance of vol. ix. of the series, though that volume was smaller and contained only 552 pages. The fascicule of coloured plates belonging to vol. x., however, is not yet ready, but will appear shortly. The present volume is devoted to the subfamily *Erastrianæ*, and includes 1222 species belonging to 136 genera, illustrated by 214 figures in the text, showing wings, neuration, head, &c.

We believe that another volume will probably complete the Noctuidæ, of which the author has already described 6197 in vols. iv.–x. of his work.

The *Erastrianæ*, as the term is used by the author, include all the British moths classed under the section Minores by Guenée, except *Acontia luctuosa* and *Erastria venustula*; the latter, however, is described by Hampson in his vol. viii. p. 493, n. 4201, as *Monodes venustula* in the subfamily *Acronyctinæ*.

The British species described and sometimes figured in vol. x., under *Erastrianæ*, are *Eublemma ostrina*, Hübn. (p. 118), *E. parva*, Hübn. (p. 136), *Lithacodia fasciana*, L. (= *fuscula*, Schiff. (p. 539), *Eustrotia uncula*, Clerck (p. 578, fig.), *Eustrotia olivana*, Schiff. (= *bankiana*, Fabr.) (p. 580), *Erastria trabealis*, Scop. (= *sulphuralis*, L.) (p. 660, fig.), and *Tarache lucida*, Hufn. (= *solaris*, Schiff.). Except *Lithacodia fuscula*, all these species are local in Britain (though one or two are common in their special

localities) and some are very rare, though the small species of *Eublemma* may be liable to be overlooked, from their inconspicuous appearance; they frequent waste ground.

The *Erastrianæ*, as recognized by Sir George Hampson, are characterized as follows:—"Vein 5 of the hind wing is typically nearly fully developed and usually arises from well above the lower angle of the cell, although it is rarely obsolescent and then springs from the middle of the discocellulars; the eyes are not hairy; the tibiæ are not spined; and the larvæ have the first pair or first two pairs of prolegs aborted.

"The subfamily is to a large extent confined to the tropical and warmer temperate regions, especially the more arid districts, and it has few species in the colder zones, and none in the Arctic and Alpine zones."

We may add that the species are usually of small or moderate size and of varied patterns, and often attractively coloured, the so-called "*Noctua*-pattern" being rarely distinctly indicated.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

January 11th, 1911.—Prof. W. W. Watts, Sc.D., M.Sc., F.R.S., President, in the Chair.

The following communication was read:—

'The Zonal Classification of the Salopian Rocks of Cautley and Ravenstonedale.' By Miss G. R. Watney and Miss E. G. Welch.

The district described lies north-east of Sedbergh and west of the Dent Fault. An account of the literature treating of previous work is given, and the succession of the zones is described. They are as follows:—

Lower Ludlow.	D 3.	Zone of	*Monograptus leintwardinensis.*
	D 2.	„	*Monograptus nilssoni.*
	D 1.	„	*Phacops obtusicaudatus.*
Wenlock.	C 4.	„	*Cyrtograptus lundgreni.*
	C 3.	„	*Cyrtograptus rigidus.*
	C 2.	„	*Monograptus riccartonensis.*
	C 1.	„	*Cyrtograptus murchisoni.*

Below are Valentian rocks (A & B divisions of the Stockdale Shales).

The Wenlock Beds are most fully developed in some streams entering the River Rawthey from the south. The detailed succession of these is given, and confirmatory sections are described in other parts of the district.

The Ludlow Beds are found mainly in the northern part of the area, where the geology is simpler.

A comparison is instituted between these beds and those described in the Welsh Borderland by Miss Elles & Miss Wood (Mrs. Shakespear), and those of Wenlock age in Southern Sweden described by Tullborg.

Cautley.	Welsh Borders.	Southern Sweden.
Zone of *Monograptus leintwardinensis.*	Zone of *M. leintwardinensis.*	
Red grits and flags ? =	„ *M. tumescens.* „ *M. scanicus.*	
Zone of *Monograptus nilssoni.*	„ *M. nilssoni.*	
„ *Phacops obtusicaudatus.* ? =	„ *M. vulgaris.*	
„ *Cyrtograptus lundgreni.*	„ *C. lundgreni.*	Zone of *C. carruthersi.*
„ *Cyrtograptus rigidus.*	„ *C. rigidus.* „ *C. linnarssoni.* „ *C. symmetricus.*	„ *C. rigidus.*
„ *Monograptus riccartonensis.*	„ *M. riccartonensis.*	„ *M. riccartonensis.*
„ *Cyrtograptus murchisoni.*	„ *C. murchisoni.*	„ *C. murchisoni.*

A description of a *Cyrtograptus* intermediate in character between *C. rigidus* and *C. symmetricus*, and of a new *Monograptus* from the *Nilssoni* Beds of Wandale Hill, is given in a palæontological section.

MISCELLANEOUS.

With reference to Plate vi. in our issue of September last, Major Connolly finds that, in course of reproduction, the artist's original drawings were reduced by one-fortieth. This is unfortunate, as the *small* figures were intended to represent the *actual size* of the specimens figured. Also in fig. 1 of the same plate, representing *Euomphalus turriformis*, the shell erroneously shows a marginal suture. This is due to a wrong light-effect, and does not exist in the original.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 39. MARCH 1911.

XXVI.—*Descriptions and Records of Bees.*—XXXIV.
By T. D. A. Cockerell, University of Colorado.

Lithanthidium, gen. nov.

Related apparently to *Anthidium*; robust, thorax above very finely and densely punctured, sides of thorax with large coarse punctures (this sculpture practically as in *Dianthidium sagi*); hind tibiæ densely hairy. Abdomen probably with a ventral scopa, but it is not clearly preserved; stigma large; marginal cell narrowly rounded at tip, the apex a little below costa; two submarginal cells, the second receiving both recurrent nervures, the first some distance from base, the second a little before apex; outer side of second s.m. with a single gentle curve; basal nervure strongly arched at lower (basad) end, where it meets the transverso-medial, the latter being slightly arched outwards and not noticeably oblique. The arching of the base of the basal nervure is also observed in the living (Asiatic) *Protanthidium steloides*, which differs, however, in the shape of the second s.m., and in having the second r. n. going beyond apex of second s.m. There is some resemblance to the fossil *Pelandrena reducta*, but in *Pelandrena* the second s.m. is contracted apically and the t.-m. is oblique.

Lithanthidium pertriste, sp. n.

Black, very robust. Head and thorax about 4 mm. long, abdomen about 4½, doubtless 5 when extended; anterior

wings 5 mm. long, strongly dusky throughout, stigma and nervures dark reddish brown. Wing-measurements as follows in μ: depth of stigma 255; length of marginal cell 1632; depth of marginal cell 425; upper end of second t.-c. to end of marginal cell 935; second s.m. on marginal 476; length of outer side of second s.m. 510; first discoidal on second s.m. 153; greatest length (diagonally) of first discoidal 1445; third discoidal on second s.m. 595; end of second r. n. to end of second s.m. 51; basal nervure on first s.m. 272; b. n. on first discoidal (not allowing for curve) 578; length of t.-m. 408.

Hab. Fossil in the Miocene shales of Florissant, Colorado, at Station 14 (*W. P. Cockerell*).

Dasypoda comberi, sp. n.

♀.—Like *D. plumipes* (Panz.), perhaps averaging rather smaller, with the hair of head and thorax above entirely fulvo-ochraceous, without black or fuscous. Wings duskier, especially the broad apical margin; knees, tibiæ, and tarsi ferruginous, outer side of anterior tibiæ dusky; thick fringe of fifth abdominal segment, and hair of apical segment, warm ochraceous, not at all sooty or black; scattered hair between the abdominal bands partly black and partly ochraceous.

♂.—Pubescence pale yellowish, almost grey, white beneath; abdomen slender, about 2 mm. broad; flagellum dusky ferruginous beneath; legs coloured as in female; no dark hair on vertex; abdomen without black hair; sixth ventral segment broadly emarginate in middle, and with the lateral margins raised and thickened.

Hab. Karachi, India, 2 ♀, 1 ♂ (*E. Comber*). British Museum. The females are labelled April 1909. The genus is new to India.

In Friese's table of Palæarctic species the Indian species falls between *D. plumipes* and *D. panzeri*, having rather the coloration of the latter, while the abdomen is formed as in *plumipes*, only rather more slender in the female, considerably more in the male. In the female the third antennal joint (about 425 μ) is equal to the next two combined. It is evident that *D. plumipes*, var. *flavescens*, Friese, from Egypt, is very like our insect, being substantially a *plumipes* coloured like *panzeri*; but, so far as Friese's account shows, the legs of *flavescens* are as in *plumipes*, and the colour-peculiarities seem to be confined to the abdomen. *D. grohmanni*, Spinola, from Sicily, has the legs coloured as in *D. comberi*, but it is a large form like *D. visnaga*.

Euaspis (*Parevaspis*) *carbonaria* (Smith).

Salsette, N.W. India (*E. Comber*). British Museum.

Euaspis (*Parevaspis*) *basalis* (Rits.).

Both sexes from Takao, Formosa, Aug. 20, 1907 (*Sauter*). Berlin Museum. These agree with the southern material of *E. basalis*, rather than with the Japanese, but I have not been able to recognize more than one species (*cf.* Ann. & Mag. Nat. Hist., Sept. 1904, p. 207).

Systropha tropicalis, sp. n.

♂.—Length about 9 mm.

Black, closely resembling *S. curvicornis* (Scopoli), with the same peculiar antennæ, except that the apical joints are considerably shorter, but differing conspicuously as follows: Wings darker and browner; stigma and nervures very dark brown; first s.m. much shorter; sides of vertex very smooth and shining; area of metathorax a broad sharply-margined smooth and shining transverse channel. Abdomen narrower, much more delicately sculptured, finely pruinose-pubescent (not coarsely hairy) above, at sides with rather abundant long pale hair; apex rounded, rather narrow; second ventral segment with a pair of low transversely elongated shining tubercles, third with a pair of broad conical tubercles.

♀.—Length about 8 mm.

Like *S. curvicornis*, with the same thickened flagellum, but wings as described for male; mesothorax and scutellum more shining; area of metathorax granular, but sharply margined. Abdomen more finely sculptured; segments 3 to 5 with short black hair.

Hab. Ceylon, 1910 (*E. Comber*). British Museum.

The type is a male from Kandy, collected in February; another male is labelled "Kandy," March. Females are from Kandy (February) and Matale (March). Nurse records *S. planidens*, Giraud, from Quetta, but the occurrence of this Palæarctic genus in Ceylon is very remarkable.

Melecta formosana, sp. n.

♀.—Length about 14 mm.

Black, the abdomen stained with reddish, the hind margin of second segment broadly clear ferruginous; head and thorax with abundant long pale ochreous hair, but very long dark brown hairs on vertex and at extreme sides of face,

and thorax with a broad band of dark chocolate-brown hair between the wings, also a little brown hair just below the bases of the wings, and a large tuft of the same at the base of each of the very long, curved, acute scutellar spines; legs very dark reddish or reddish black, with ochreous pubescence and ferruginous spurs; hind basitarsus straight; tegulæ margined with ferruginous. Wings very brown, though translucent; abdomen broad-conical, without spots, but covered with very fine appressed fox-red pubescence. Mandibles dark red except at base and apex; labrum broadly emarginate at apex; clypeus minutely granular, the linear margin shining; flagellum dark reddish; fourth antennal joint much longer than fifth, but not nearly twice as long; mesothorax shining, with strong separate punctures; apical plate of abdomen extremely narrow. Close to *M. himalayana*, Bingham, but differing in details of sculpture and pubescence.

Hab. Koseupo, Formosa, 1908 (*Sauter*). Berlin Museum.

This is an example of a Formosan species resembling a Himalayan one. The genus is new to Formosa.

Sphecodes formosanus, sp. n.

♀.—Length 10–10½ mm.

Black, the abdomen chestnut-red, with the last two segments and the apical middle of the fourth more or less black; face broad, yet not so broad as in *S. fuscipennis*; eyes prominent; mandibles long, curved, dark reddish in the middle, with a strong inner tooth far from the apex; hair of head and thorax dull white, rather dense on face, especially at sides, very dense along border of prothorax and tubercles. Clypeus short, transverse, shining, with large dense punctures and no median groove; antennæ black, flagellum faintly brownish; third and fourth antennal joints very short, much broader than long, fourth a little the longer, both together longer than fifth; front and vertex very strongly and densely punctured; mesothorax shining, the rather dense punctures very large and strong (not so dense as in *S. japonicus*, Ckll.); scutellum like hind part of mesothorax; pleura very coarsely rugoso-punctate; metathorax broadly truncate, the basal area shining, with very strong ridges, which are crossed by a transverse ridge, its apical part with large irregular pits; tegulæ black at base, dilute brown beyond, the margin partly whitish. Wings dark fuscous, hyaline basally; legs normal, claw-joints red at end. Abdomen shining, rather closely punctured, the punctures strong, though much

smaller than those of thorax (they are about as in *S. fusci-pennis*) ; first two segments gibbous subapically (especially at sides) and depressed apically ; apical segments with some fuscous hair.

Hab. Formosa (*Sauter*). Berlin Museum.

This type is labelled simply " Formosa " ; others are from Taihanroku, June 4 and 11, 1908. Near to the Indian *S. fuscipennis*, Smith, but that has only the first abdominal segment constricted apically. Also rather like the European *S. fuscipennis*, Rossi. The well-punctured abdomen readily separates it from the Japanese *S. japonicus*, Ckll. The genus is new to Formosa.

Andrena formosana, sp. n.

♀.—Length 12–13 mm.

Black, the small joints of tarsi reddish brown ; hair of head and thorax above ferruginous, not dense—on vertex it is dark fuscous, on under side of head and thorax it is dull white. Head very broad, facial quadrangle much broader than long ; clypeus large, smooth and shining, with scattered distinct punctures, and a faint median raised line on its lower third ; malar space linear ; process of labrum broadly truncate, the truncation shallowly emarginate ; cheeks broadly rounded, ordinary ; face on each side of clypeus rugosely punctured ; facial foveæ reddish, broad, occupying at least half distance between eye and antennæ, not separated from orbit, ending below slightly below level of upper margin of clypeus ; antennæ dark, third joint longer than the next two combined ; mesothorax and scutellum shining, strongly punctured, the punctures sparse on mesothorax posteriorly and disc of scutellum ; metathorax rugose, basal area triangular, rather poorly defined, irregularly wrinkled and rugose, without any distinct longitudinal ridges, the apical part transversely striate ; tegulæ ferruginous, darker basally. Wings strongly dusky ; stigma moderate, dark rufo-piceous, nervures rufo-fuscous ; second s.m. receiving first r. n. at (sometimes before) middle ; third s.m. twice as broad as second, narrowed one-half above ; legs normal, inner side of anterior and middle tarsi with reddish hair, but of hind tarsi with purplish sooty ; hair of hind tibiæ fuscous posteriorly ; scopa of hind femora and trochanteric floccus white. Abdomen shining, strongly, moderately closely punctured, more sparsely on first segment ; second segment very feebly depressed, less than one-half ; the very scanty hair beyond first segment dark fuscous, as also the

apical fimbria, but hind margins of segments 2 to 4 with very narrow white hair-bands, which in most of the specimens are partly or wholly lost.

♂.—Length about 9 mm.

Clypeus (except two black spots) and large triangular lateral marks (nearly filling space between clypeus and eye, but hardly going above level of top of clypeus) very light yellow; hair of head and thorax above pale reddish. Abdomen with sparse small punctures, and the hind margins of the segments reddish; third antennal joint shorter than the next two combined; abdomen without hair-bands.

Hab. Formosa (*Sauter*), 6 ♀, 3 ♂, in Berlin Museum.

The genus is new to Formosa. In its broad head this resembles *A. vitiosa*, Smith, from China, but it differs in many other respects. There is also evident affinity with the European *A. labialis*, Kirby. I possess only the male of *labialis*, which is considerably larger than that of *formosana*, with the lateral face-marks longer and the abdomen duller and much more hairy. The type of *A. formosana* is a female.

Nomada secessa, sp. n.

♀.—Length about 11 mm.

Ferruginous, marked with black and yellow; no yellow on thorax or legs; on face a little at lower corners, but no other yellow on head; pubescence scanty, short and fox-red on vertex, mesothorax, and scutellum, white on cheeks, pleura, and metathorax; clypeus with scattered fuscous hairs, especially toward sides; head broad, facial quadrangle about square; mandibles simple; labrum with a minute tooth or tubercle; area of ocelli, middle of face irregularly (enclosing a dull reddish supraclypeal patch), and hind part of cheeks black; antennæ stout, ordinary, ferruginous, the flagellum with a dusky shade; third antennal joint conspicuously shorter than fourth; mesothorax as densely punctured as possible, dull reddish, with a broad black median band and evanescent lateral ones; scutellum rather prominent, but little bilobed; metathorax with a dusky median band; pleura red; tegulæ shining red, punctured. Wings dark on apical margin; b. n. going some distance basad of t.-m.; second s.m. nearly as broad above as third, receiving first r. n. at or slightly before middle; legs shining red, femora clouded with black at base. Abdomen red, very finely punctured; first segment rather narrow, its basal half black, its apical red, without yellow; second rather narrowly black at base and apex, with a large lemon-yellow spot on each side, the

distance between the spots over twice the diameter of either; third dark at extreme base and apex, with four small spots of yellow, the inner ones mere dots; fourth broadly black at base, with an obscure yellow dot on each side, and a broad transverse median yellow band, truncate on each side and constricted in the middle; fifth with a broad yellow band across middle; pygidial plate very large, covered with shining yellowish-silvery hair; third and fourth ventral segments with large yellow marks, fifth with a bifid mark in middle and an elongate one on each side.

Hab. Formosa (*Sauter*), 1 ♀. Berlin Museum. Genus new to Formosa.

In Nurse's key to the Indian species, *Nomada secessa* runs to *N. beata*, Nurse, to which it seems to be related, differing in the sculpture of the metathorax (the area in *secessa* granular, plicate basally, without a median impressed line) and the details of the ornamentation. In Schmiedeknecht's table of European species it runs with little difficulty to *N. ruficornis*, L., to which it is evidently related, although certainly distinct.

Allodape marginata, Smith.

So far as I can at present determine, *A. marginata*, Smith, *A. philippinensis* (Ashmead), and *A. cupulifera*, Vachal, constitute a single widely distributed species. I have before me, from the Berlin Museum, one male and twenty-five females collected by Sauter in Formosa, mostly at Takao, Aug. 18 to Dec. 2, 1907. One female is from Taihanroku, June 11, 1908. The male only differs from *cupulifera* in the absence of a yellow line on the scape. The linear lateral face-marks are mentioned by Vachal, but overlooked by Bingham. The first abdominal segment in some specimens collapses on drying, giving rise to the "cupulifera" character.

A. picitarsis, Cameron, from the Laccadive Islands, is a close relative, but the light colour of the female clypeus is not at all broadened below, and there are other differences. My specimen of *picitarsis* (one of the original lot) has the first abdominal segment cupuliferous through collapsing.

Exoneura libanensis, Friese.

I am greatly indebted to the Rev. F. D. Morice for one of the original examples of this Syrian species. It is a female; the male is unknown. Mr. Morice writes me that it was found high up on Lebanon, in a climate much like that of

Switzerland or the Tyrol, among cherry-trees, vines, and fig-trees. The occurrence is very remarkable, since the other species of *Exoneura* are Australian.

Compared with the Australian *E. bicolor*, the Syrian insect differs not only in colour, but very conspicuously in the elongated face, with projecting clypeus and large malar space; also in the shape of the abdomen and the venation. Compared with *E. bicolor*, *E. libanensis* has the stigma smaller, the marginal cell narrower, the second s.m. smaller, and the lower section of b. n. much more oblique.

In general, *E. libanensis* is very like the Australian *Allodape simillima*, Smith, or the African *A. nigricollis*, Vachal; but both of these have the lower section of b. n. much more nearly vertical. *E. libanensis* has a shallow basin-like depression at the base of the metathorax, and the same is well indicated in *Allodape simillima*. There is no doubt that *E. libanensis* is an offshoot from *Allodape*, but it probably arose by a parallel variation, quite independently of the Australian forms. The South-African *Allodape rufogastra*, Lep. (the type of the genus), has the lower section of b. n. oblique as in *Exoneura libanensis*. This is not the case, however, in *A. variegata*, Smith, another species with red abdomen.

In view of the differences noted, *Exoneura libanensis* may be taken as the type of a subgenus (? genus) Exoneuridia.

Lithurgus collaris, Smith.

This Japanese species was described from the male. A female from Formosa, 14½ mm. long, agrees with Smith's description, except for the usual sexual characters, including the roughened mesothorax. The clypeus is longitudinally keeled, and the hair along its lower margin, as well as that on lower part of cheeks and front of anterior coxæ, is ferruginous. The Polynesian *L. albofimbriatus*, Sichel, has a tuft of black hair just behind the wings, but is otherwise practically the same. The Formosan *L. collaris* was taken by Sauter at Pilam, 1908, and is in the Berlin Museum.

Andrena albihirta (Ashmead).

Mr. S. A. Rohwer took both sexes in numbers at flowers of *Salix brachycarpa*, at Florissant, Colorado, June 1 and 2, 1907. The male has no tooth on the mandibles below and is not the same as *A. perarmata*, Ckll., which Viereck in 1904 considered synonymous. True male *A. perarmata*, with toothed mandibles, has been taken by Mrs. Bennett at

Boulder, Colorado, April 10, at flowers of *Negundo*. The male of *A. cockerelli*, Grænicher, has the hair on lower half of sides of metathorax white, and hair all white on middle and hind femora, but otherwise it is like *A. albihirta*. Male *albihirta* has the hair on sides of metathorax all black and a good deal of long black hair on all the femora.

Prosopis mediolucens, sp. n.

♂.—Length 6 mm. or slightly more.

Black, with yellow markings (turned red by cyanide in the type). Head ordinary, rather broad; front extremely densely and minutely punctured, sides of vertex irregularly and more sparsely, showing the shining surface; clypeus with large close punctures; face below antennæ yellow; supraclypeal mark ending obtusely between antennæ; lateral marks ending at about level of middle of scape, where they are obliquely truncate, somewhat notched; scape only moderately thick, with a broad yellow stripe in front; flagellum dark ferruginous above, pale ferruginous beneath; thorax with short white hair, as usual; mesothorax finely and closely punctured, but shining, scutellum more coarsely and irregularly punctured; metathorax convex, finely rugulose, but basal area large, semicircular, smooth and shining, with strong transverse ridges laterally; pleura coarsely and densely punctured; upper border of prothorax interrupted in middle, and tubercles yellow; tegulæ light testaceous. Wings clear, stigma ferruginous; first r. n. joining extreme apical corner of first s.m.; second s.m. much longer than high. Legs shining, with the knees, apical third of anterior femora beneath, anterior tibiæ except a patch behind, middle and hind tibiæ except a broad subapical annulus, and the basitarsi yellow; small joints of tarsi ferruginous. Abdomen shining, finely punctured, the first segment sparsely and feebly; hind margins of first three segments at sides thinly hairy; apex with a brush of white hair.

Hab. Takao, Formosa, Nov. 21, 1907 (*Sauter*). Berlin Museum.

Genus new to Formosa. An ordinary-looking little species of Pakearctic facies, with face-marks nearly as in the American *P. citrinifrons*, Ckll., but recognizable by the character of the metathorax. With a compound microscope it is seen that the apical half of the metathoracic enclosure has three complete transverse ridges, which are quite straight, while the basal half has four somewhat oblique ridges on each side, these being evanescent and more or less coalescent in the middle. So far as I know, this sculpturing is unique.

Epeolus peregrinus, sp. n.

♂.—Length about 7 mm.; expanse about 14.

Black, including legs and antennæ, except that the scape has a red spot at extreme base; pubescent markings white; apical half of mandibles dark reddish; labrum coarsely rugoso-punctate, with a pair of little tubercles on the lower part; eyes pale grey, orbits strongly converging below; face, except lower margin of clypeus, densely covered with white hair; third antennal joint much longer than fourth, but not as long as fourth and fifth together; sides of vertex shining, with very large punctures; occipital margin sharp; cheeks covered with white hair; white hair on upper border of prothorax interrupted in middle, the interval finely punctured; mesothorax and scutellum shining, with large irregular punctures; mesothorax with a pair of short, broad, greyish-white hair-bands anteriorly, one half as long on each margin in front of tegulæ, and a spot at each posterior corner; scutellum projecting but obtuse, with a strong median depression; axillar teeth thick, well-developed; mesopleura and mesosternum densely covered with white hair, but a dusky band extends obliquely upwards and forwards from middle coxæ halfway across pleura, and ventrally there is a small black spot on each side; tegulæ black, punctured, the margin slightly reddish. Wings strongly smoky, stigma and nervures very dark rufo-piceous; marginal cell very obtuse at end, not appendiculate; second s.m. narrowed almost to a point above, very broad below, receiving first r. n. far beyond the middle. Tibiæ and tarsi with white hair on outer side, tarsi with ferruginous on inner; spurs dark. First abdominal segment broadly covered with white hair at sides, the inner excavation broad and rounded, ending posteriorly in a point, where the apical band ends obliquely, being as widely interrupted on the margin as the breadth of the median black area; second segment with a very broad band on each side, having a large anterior lobe laterally, the band squarely interrupted, the interval about equal to either lateral section; remaining segments with large subdorsal spots, the third also with lateral spots; first ventral segment with sharp ridges forming a sort of very broad Y; fourth with a fringe of black curled hairs ("Wimperhaare" of Friese).

Hab. Nasik, N.W. India, Sept. 28, 1908 (*N. B. K.*). British Museum.

Nurse records *E. pictus* (Nyl.) from Quetta; otherwise the genus is new to India.

The present species belongs to Friese's group 1 (dark forms), and by the character of the labrum is allied to *E. tristis*, Smith, differing by the smaller size and the markings of the abdomen.

Nomioides karachensis, sp. n.

♀.—Length about 7 mm.

Head and thorax brassy green, with quite abundant white hair, especially long, forming a sort of radiating tuft, on postscutellum; head shaped like male *N. variegata* (as figured by Handlirsch), with the red eyes deeply emarginate; front granular and punctured, vertex more shining; clypeus small, shining, sparsely punctured, pale yellow; lateral face-marks very small, oblong, situated between clypeus and base of mandibles; mandibles simple, pale yellow, with the apex ferruginous; scape slender, pale yellow, black behind except at base; flagellum ferruginous, infuscated above; mesothorax and scutellum brilliantly shining; tubercles, extending to line on prothorax, pale yellow, and a pale spot in middle of rather projecting postscutellum; sides of prothorax beneath dark purplish; area of metathorax granular, plicatulate basally, and with a tuft of very white hair on each side; tegulæ hyaline, with a yellowish spot. Wings milky hyaline, nervures and the large stigma very pale yellowish; marginal cell rather broadly obliquely truncate at apex; second and third submarginals greatly narrowed above; first r. n. meeting second t.-c.; b. n. very strongly bent. Legs black basally; the ends of the femora more or less broadly, the tibiæ and the tarsi pale yellow, the hind tibiæ with a large dusky patch in front. Abdomen light yellow, broad, dull, only the hind margins of the segments shining; first segment with a dark greenish patch on each side basally and a narrow, black, transverse, subapical band, not nearly reaching the lateral margins; segments 2 to 4 with dusky lateral basal marks, those on 2 largest and darkest; sides of apical region with long white hair; apical half of venter very strongly stained with dark brown.

Hab. Karachi, N.W. India, July 1909 (*E. Comber*). British Museum.

Very distinct by its large size and pallid abdomen, wherein it closely resembles the American *Perdita pallidior*, Ckll., and its allies. The face-markings are nearly as in the much smaller *Nomioides parvula* (Fabr.).

Nomioides comberi, sp. n.

♂.—Length 6 mm. or slightly more.

Head and thorax bluish green, truncation of metathorax yellower; abundant white hair as in *N. karachensis*, with the same tuft on postscutellum; clypeus, labrum, small round mark between clypeus and base of mandibles, and mandibles except ferruginous apex all white; eyes very deeply emarginate; shape of head about as in male *N. fallax* (as figured by Handlirsch), but emargination of eyes much stronger; face and cheeks with much white hair; front dullish, granular, vertex shining; scape short, cream-colour, black behind; flagellum long, rather thickened apically, black above, beneath pale brown, reddish at base, joints 9 to 12 whitish, last joint black beneath, strongly contrasting; upper border of prothorax and tubercles white; no light marks on scutellum or postscutellum; mesothorax and scutellum shining; area of metathorax very finely transversely striate, the striation passing into a cancellate pattern in the middle; tegulæ hyaline, with an angular white patch. Wings perfectly clear, strongly iridescent; stigma and nervures very pale yellow; second r. n. bowed outwards; first r. n. meeting second t.-c. or entering base of third s.m. Legs marked as in *N. karachensis*, but the hind tibiæ and all the tarsi are white, though the anterior and middle tibiæ are light canary-yellow. Abdomen rather narrow, shining, black above and below, with pale yellow bands on segments 2 to 5, the first two slightly interrupted, or the first entire, the last two broadly interrupted; venter without bands.

Hab. Karachi, N.W. India, three males (*E. Comber*). British Museum. One is dated September 1909.

This is too different from *N. karachensis* to be its male. There is some resemblance to *N. variegata* (Oliv.), but the large size and peculiar coloration of the antennæ readily distinguish it.

In his last publication (Trans. Ent. Soc. London, Sept. 1908) Edward Saunders removed *Nomioides* from the vicinity of *Halictus* and placed it between *Cilissa* and *Panurgus*. It certainly appears to have Panurgine affinities, as shown by the truncate marginal cell, the slender tongue, and the general appearance. The species look exactly like species of the American Panurgid genus *Perdita*, and it is difficult to believe that *Perdita* did not arise either from *Nomioides* or some close relative now extinct. There are, however, great differences in the mouth-parts as well as the venation; thus

in *Perdita* the maxillary blade far exceeds the palpus, while the reverse is true in *Nomioides*. If *Perdita* is related to *Nomioides*, as suggested, we have a remarkable illustration of the persistence of colour-patterns in the face of great structural changes; and as the different colour-types of *Nomioides* can hardly have given rise separately to similar types of *Perdita*, we have also an illustration of kaleidoscopic variation, the characters combining in various ways and sorting out again, no doubt according to Mendelian principles. A strong argument against the suggested relationship may be based on the facial foveæ of *Perdita*—certainly an Andrenoid character.

XXVII.—*Notes on the Cocoons and Descriptions of Four new Species of the Genus* Trichostibas. By Embrik Strand, of the Royal Berlin Zoological Museum.

In his interesting paper on the genus *Trichostibas* (Proc. U.S. Nat. Mus. vol. xxxviii. no. 1765, October 15, 1910) Mr. August Busck describes, besides new species, also the cocoons, referring to the previous accounts of these. I should, however, like to point out that more and older accounts of these cocoons exist in the literature, viz., in Bates, 'Naturalist on the Amazons,' and in Blanchard, 'Metamorphoses, Mœurs et Instinctes des Insectes,' 2e édit. 1877. Bates figures and describes (*l. c.* p. 379 of the German edition: Leipzig, Dyk'sche Buchhandlung, 1866) the cocoon and gives also a most interesting account of the manner in which the larva manages to construct the network of the cocoon. Bates gives his insect no name, but regards it as belonging to the Lithosiidæ, which is easily explained through the great similitude of the moths of the genus *Trichostibas* to the Lithosiidæ; owing to this similitude, Walsingham points out (Proc. Zool. Soc. London, 1897, p. 115) that if Walker described the specimens of *Trichostibas fumosa* Z., which probably are in the British Museum, "he would be most likely to locate the species in the Lithosiadæ." Blanchard gives (*l. c.* p. 298) a figure of the cocoon, which he ascribes to an "Alucita du Brésil."

In the Royal Berlin Zoological Museum are several cocoons of this kind, most of them belonging to the former Staudinger Collection, now in the possession of the Museum. A few remarks on these may not be without interest, as they differ

not only in the colour, as pointed out by previous authors, but also in the shape, the network, &c.

In the ancient collection of the Museum is one cocoon from Caracas (*Gollmer* leg.) and one from Cuba (*Gundlach* leg.), both, I am sorry to say, without the insects. The former is 15 mm. long and 8 mm. broad, the supporting thread is only 7 mm. long, but has probably been torn off; the colour black. The latter cocoon is 12 × 6 mm., the thread ca. 50 mm., the colour white. In the Staudinger Collection are three bright salmon-red or orange-coloured cocoons from the Upper Amazons—Fonteboa, S. Paulo, and Pebas, the first two with the insects bred from them (*Trichostibas fonteboæ* sp. n., and *sancti-paulensis* sp. n.)—and a white one from Merida. The latter differs from the one from Cuba inasmuch as the network is more fine-meshed; the supporting thread is only 4 mm. long and at the end strongly enlarged in the form of a plate, which is 2·5 mm. wide; I am not sure, however, if this thread is entire. The species described below as *Trichostibas merida* sp. n. belongs probably to this cocoon. The supporting thread of the orange-coloured cocoons bears fine, perpendicularly offstanding fibrils, which are hardly to be seen with the naked eye, and are as long as the diameter of the thread. Owing to these fibrils the thread has a rough appearance and easily clings to other objects. The thread of the cocoon from Pebas bears, moreover, long, fine, woolly-looking fibres, which are mostly parallelly directed. The white cocoon from Merida and the black one from Caracas have no such perpendicular fibrils at all; the orange ones, on the contrary, bear such ones also on the heavier parallel threads of the network, but none on the thinner cross-threads; woolly-looking fibres are never to be seen on the cocoons themselves. The supporting thread is never fastened on the inner side of the wall of the cocoon, but often distinctly on the outer side. The cocoon from S. Paulo is especially interesting, owing to the fact that the meshes are filled up with a tissue of fine fibres, so that now but little of the original network is to be seen; this cocoon is also more cylindriform than the others, 25 by 11 mm., the thread ca. 160 mm. long, while the thread of the cocoon from Fonteboa is only 65 mm. The meshes form mostly an elongate parallelogram, but those of the black cocoon from Caracas are pentagonal or hexagonal; it measures 15 by 9 mm. The opening at the upper end of the cocoon is apparently made, or at least widened, when the moth issues; the network around the opening is often denser than in the middle of the cocoon. Blanchard says (*l. c.*) that the cocoons may

be "d'une jolie couleur violette"; it appears from his figure that he has seen the perpendicular fibrils.

I now give descriptions of three of the moths belonging (or, in one case, probably belonging) to the said cocoons and of one more, to which no biological information at all is appended.

1. *Trichostibas merida* Strand sp. n.

2 ♀ ♀ and 2 ♂ ♂ from Merida (*Hahnel* leg.).

Related to *Tr. famosa* Z., but the male has no "aus ockergelben, kurzen, gedrängten Haarschuppen gebildeten Fleck" on the underside of the primaries, the markings differ (also from those of the likewise nearly related *Tr. imitans*, F. et Rgh.), &c.

♀. Labial palpi, face, head, and antennæ black with indistinct violet sheen; abdomen brownish black, with at least at the end of the upperside a little violet sheen. Thorax with patagia greyish black. Primaries dark brown, with cupreous-violet sheen and with dirty greyish-white markings, as follows: across the wing at the end of the basal third are three longish spots—an upper, which is distant from the costal edge about the length of the shortest diameter; a lower, which is a little more remote from the dorsal edge than the upper is from the costal edge; further a twice as long central spot: just beyond the middle of the wing is a broad band, broken up in two or more spots, an upper, longish oval one touching the costal edge, and a middle in and at the end of the cell, which two spots at the inner end almost unite, but towards the margin distinctly diverge; the middle spot unites with a dirty greyish-white cloud, which extends along the dorsal edge and perhaps sometimes appears as a distinct third spot. Along the outer margin is a band in the middle widening so as to form a tooth, that almost unites with the middle spot of the submedian band. The veins partly dark brown. The edge of the wing as well as the cilia like the ground-colour. Underside of the primaries dark brown, without the sheen or the spots of the upperside. Secondaries rather transparent on the basal half, opaque, blackish on the distal, especially at the apex. Underside more uniformly dusky than the upperside, but nevertheless lighter than the underside of the primaries. Cilia as dark as on the primaries. Ovipositor about 2–3 mm. protruding, brownish. Alar expanse 32·5 mm., alar length 16 mm., length of the body (without ovipositor) 12 mm.

♂ differs from the ♀ in being smaller (alar expanse

27 mm.; length of the wing 13, of the body 11 mm.); the primaries are in the dorsal half of the basal area partly lead-coloured; the face and vertex of one of my specimens greyish, of the other dark-coloured (perhaps the former is the natural colour, as the latter specimen appears to be somewhat greasy).

Most probably the described cocoon from Merida belongs to this species.

2. *Trichostibas sanctipaulensis* Strand sp. n.

1 ♀ from S. Paulo, Upper Amazonas (*Hahnel* leg.). Cocoon, *vide supra*.

Is one of the largest of the known *Trichostibas*: alar expanse 36 mm.; length of the wing 16·5, of the body 15 mm.; and accordingly almost as large as *Tr. isthmiella* Busck, to which our species appears to be also in other respects closely related.

Labial palpi black. Tongue whitish. Face and head black, with bluish and greenish sheen. Antennæ dark blue above, blackish below. Thorax and primaries dark with, in certain lights, a rather strong violet sheen, in others rather dusky, appearing unicolorous or hardly with a slight trace of a lighter transverse band at the end of the basal third and with blackish cilia. Secondaries as the cilia of the primaries, at the base slightly transparent, the veins also in the middle a little darker than the wing. Underside of both wings dusky, unicolorous grey-brownish black, the distal half of the cilia slightly lighter. Legs as the thorax, the violet sheen partly rather strong. Abdomen like that of the following species.

3. *Trichostibas fonteboæ* Strand sp. n.

1 ♂ from Fonteboa, Upper Amazonas (*Hahnel* leg.). Cocoon, *vide supra*.

From *Tr. sanctipaulensis* m. this species differs by a distinct, dirty greyish-white, transverse (a little obliquely directed) band at the end of the basal third of the primaries; this band is 1·8 mm. broad and about 1 mm. distant from both the costal and the dorsal edge, almost straight and parallel-sided and about 2·5 mm. (in the dorsal area) to 4 mm. (in the costal area) distant from the base. At the end of the second third is an indistinct, horseshoe-shaped, greyish-white, transverse figure, the convexity of which is directed towards the margin and the anterior end is somewhat dilated; sometimes perhaps this figure is divided into three spots. The underside of the primaries and the ground-colour of the secondaries as well as the cilia of both

wings are as in *Tr. sanctipaulensis*, but the secondaries are in the basal two-thirds strongly transparent and accordingly greyish white appearing, with hardly darker veins. The hair pencil of the base of the costa of the secondaries long and snow-white. The underside of the secondaries only in the basal and dorsal area a little lighter than the primaries. Abdomen anteriorly more greyish than the thorax, posteriorly as this or with a stronger greenish sheen. Anal tuft distinct. Hind tibia thickly covered with long hairs. Alar expanse 29 mm.; length of the primaries 13, of the body 12·5 mm.

That this form is not the other sex of the previous species (*Tr. sanctipaulensis* m.) is evident from, among others, the fact, that the cocoons are different (*vide supra*).

4. *Trichostibas distincta* Strand sp. n.

1 ♂ from Chiriqui, Vulkan, 1892 (*Trötsch* leg.).

Belongs to the spotted group of the species and is easily distinguished. Primaries olivaceous brown, with light, unusually distinct spots, which are so large as to fill up at least half of the wing, light greyish white, sharply marked, and form the following figures: in the basal half a transverse band consisting of four longish spots, only indistinctly separated by the veins, of which the posterior touches the dorsal edge and is about three times as long as broad, the following is hardly half as long as the posterior, the next following is about two-thirds as long as the posterior, while the anterior is the smallest of the four and does not touch the costal edge. The area of the outer margin, as well as the cilia, covered with a band of the same light colour, which is 2–3 mm. broad and posteriorly and submedially indistinctly unites with a large, roundish, but rather irregular spot, which fills up almost the whole median area from the costal edge to the fold, and looks like an irregular annuliform figure, including a triangular spot, or as if formed by six to seven spots, partly joining. Underside of the primaries greyish brown, along the outer margin somewhat lighter, in the dorsal area with a yellowish-whitish spot, and before this with some violet sheen. Secondaries transparent, with blackish-brown cilia and veins, the costal area and a line on the outer margin opaque, blackish brown; of the hair pencil of the costal edge only a few greyish-white hairs are to be seen. The body is much worn, but appears, as well as the appendages, to be dark brown or blackish; thorax above partly or wholly greyish white.

Alar expanse 27 mm.; length of the wing 12·5, of the body 10 mm.

XXVIII.—*Rhynchotal Notes.*—LIII. By W. L. Distant.

Neotropical Pentatomidæ.

Genus Galeacius.

Galeacius, Dist. Biol. Centr.-Am., Het. i. p. 316 (1889).

Type, *G. tessellatus*, Dist.

Galeacius crowleyi, sp. n.

Head pale castaneous, apex of central lobe dull ochraceous; antennæ ochraceous, second joint fuscous, first joint not quite reaching apex of head, first, second, and third joints short, subequal in length, fourth and fifth longest and subequal; pronotum with the lateral and anterior areas ochraceous, the basal area brownish ochraceous, the middle of the anterior area appears as an elongate spot, angularly narrowed and produced posteriorly with its base dark castaneous, the produced lateral angles with a central waved transverse castaneous line, their apices broadly obliquely truncate, the basal area with a darker longitudinal fascia on each side; scutellum brownish ochraceous, with large pale ochraceous marginal spots, situate two at base, two on each lateral margin, and two subapical, the apex also broadly pale ochraceous, all these spots are more or less narrowly margined with castaneous, and the subapical spots are posteriorly sinuate; body beneath and legs ochraceous; head beneath, a central fascia to sternum, broad lateral fasciæ to abdomen (transversely connected before apex) piceous or black; rostrum reaching the posterior coxæ, its apex black; femora and tibiæ more or less annulated with pale ochraceous.

Long., ♂, 9 mm.; exp. pronot. angl. 7 mm.

Hab. Brazil, St. Catherine (Crowley Bequest, Brit. Mus.).

Allied to *G. martini*, Schout., from which it may be separated, apart from colour-differences, by the apices of the strongly produced lateral angles of the pronotum, which are broadly obliquely truncate, not subangulate.

Genus Polytes.

Polytes, Stål, Öfv. Vet.-Ak. Förh. 1867, p. 492.

Type, *P. lineolatus*, Dall.

Polytes fenestra.

Polytes fenestra, Bredd. Soc. Ent. xviii. p. 122 (1903); Schout. in Wytsm. Gen. Ins. fasc. xxiv. pl. iii. fig. 4 (1904).

Var.—Differs from the typical form as figured by Schouteden in having the central black longitudinal fascia to the scutellum obliquely branching on each side near middle to lateral margins.

Hab. E. Peru; Marcapata (Brit. Mus.).

Polytes rubromaculatus, sp. n.

Black; pronotum with the lateral margins very narrowly ochraceous and with two large suboblong sanguineous spots on each side of middle and which nearly reach base, but only extend a little beyond middle anteriorly; scutellum with an oblique sanguineous fascia on each side near base and two more longitudinal sanguineous fasciæ, somewhat close together, on apical area; body beneath and legs shining blackish; antennæ piceous, first, second, and third joints short, almost subequal in length, fourth and fifth joints much longer and about subequal in length; head thickly coarsely punctate; pronotum and scutellum thickly punctate, but less so on the sanguineous spots; rostrum brownish ochraceous, the apical joint black; body beneath thickly, rather finely punctate, posterior margins of the sixth and anal segments ochraceous; lateral margins of the prosternum very narrowly ochraceous.

Long. 8 mm.

Hab. Ecuador; Santa Inéz (*R. Haensch*, Brit. Mus.).

Polytes leopardinus, sp. n.

Head black; pronotum and scutellum sanguineous, longitudinally striped with black; pronotum with six longitudinal black stripes, the lateral ones broadest, the two central ones more or less fused and obliquely widened posteriorly, extreme lateral margins narrowly ochraceous; scutellum with six longitudinal black stripes, the outermost short and oblique on basal area, intermediate stripe discontinuous, the two central stripes continuous, more longitudinal, and broadened at their bases; body beneath and legs black, a lunate spot at apex of abdomen, two contiguous spots near anterior margin and the lateral margins (narrowly) of prosternum, and costal spots ochraceous; rostrum piceous, bucculæ ochraceous: head thickly punctate: antennæ mutilated in typical

specimen; pronotum and scutellum thickly but very finely punctate; body beneath thickly finely punctate.

Long. 9 mm.

Hab. Peru.

Polytes bicolor, sp. n.

Head, pronotum, body beneath, and legs black or piceous; scutellum sanguineous, its basal margin black; two contiguous spots near anterior margin and narrow lateral margins of prosternum, apex of central lobe to head, coxal spots, and a lunate spot at apex of abdomen ochraceous; antennæ black, first, second, and third joints short, almost subequal in length, fourth and fifth considerably longer and also subequal in length; head punctate and finely wrinkled, the lateral margins rather strongly sinuate; pronotum and scutellum thickly but very finely punctate; body beneath thickly, finely, but distinctly punctate; rostrum piceous or black.

Long. $8\frac{1}{2}$ mm.

Hab. Peru.

Genus Chelycoris.

Demoleus, Stål, Öfv. Vet.-Ak. Förh. 1867, p. 493 (nom. præocc.).
Chelycoris, Bergr. Rev. Ent. x. p. 235 (1891), n. nom.

Type, *C. scitulus*, Walk.

Chelycoris vittatus, sp. n.

Head and pronotum ochraceous, thickly, coarsely, darkly punctate; head with the apex of the central lobe somewhat distinctly prominent; ocelli red, much nearer eyes than to each other; antennæ ochraceous, first, second, and third joints shortest and subequal in length, fourth and fifth longest and subequal; pronotum with the lateral margins slightly laminate, oblique, concolorously punctate, lateral angles rounded, longer than head, about twice as broad at base as medial length, declivous towards head at less than one-third from base, the disk moderately rugulose; scutellum ochraceous, thickly finely punctate, with two broad dark oblique fasciæ with a common origin at base and obliquely directed on each side to a little beyond middle, where they are outwardly broadened and a little upturned; between these fasciæ and the lateral margins near base is a somewhat circular patch of the same dark colour, some of the punctures in these dark areas are blackish, longer than broad at base,

the apical area obliquely deflected; body beneath pale ochraceous, the legs darker ochraceous; sternum and abdomen thickly concolorously punctate; mesosternum centrally sulcately impressed; abdominal incisures transverse on disk, obliquely deflected and moderately bent on lateral areas, apices of incisures at lateral margins distinctly tuberculate, spiracles prominent and tuberculate, nearer to anterior incisures than to lateral margins.

Long. 11½ mm.

Hab. Paraguay; Sapucay (*W. Foster*, Brit. Mus.). Brazil; Goyaz.

Differs from *C. haglundi*, Mont., and *C. lethierryi*, Mont., in the apically narrower head and the totally different and fasciate punctuations to the scutellum.

Genus Moncus.

Moncus, Stål, Öfv. Vet.-Ak. Förh. 1867, p. 524.
Hemingius, Dist. Ann. & Mag. Nat. Hist. (7) iv. p. 423 (1899).

Type, *M. obscurus*, Dall.

When revising Walker's species in 1899 I accepted that writer's arrangement and labelling of his *Ochlerus scaber* at its face value, although on founding my genus *Hemingius* on that species I stated that the type did not agree with the description. I wrote: "Walker, in his diagnosis of this species, describes the scutellum as 'more than half the length of the abdomen,' whereas it reaches the apex of the abdomen &c." On further consideration I think it certain that Walker misplaced the labels, for Stål saw Dallas's type before Walker commenced his Catalogue, and I therefore sink my genus and follow Stål's determination.

Moncus obscurus.

Ochlerus obscurus, Dall. List Hem. i. p. 157 (1851).
Moncus obscurus, Stål, Öfv. Vet.-Ak. Förh. 1867, p. 524.
Hemingius scaber, Dist. Ann. & Mag. Nat. Hist. (7) iv. p. 424 (1899).

Herrichella, gen. nov.

Body subovate; head longer than broad, lateral margins moderately reflexed, lateral lobes longer than the central lobe, passing its apex but not meeting beyond it, their apical margins distinctly curved inward; eyes prominent, moderately transversely exserted, distinctly separated from base of head; ocelli placed very near base; antennæ five-jointed, first joint slightly passing apex of head, second joint scarcely

as long as first, third longest, fourth and fifth subequal in length, each much shorter than third; antenniferous tubercles distinctly outwardly spined in front of eyes; pronotum about twice as broad at base as long, anterior angles shortly transversely spined, the lateral angles subprominent and emarginate, lateral margins oblique, anterior margin slightly concave; scutellum shorter than corium, almost as long as head and pronotum together, moderately convex, the apex rounded; corium somewhat apically widened, its apical margin finely sinuate near apex; tegmina somewhat short, the veins longitudinal, not anastomosed, but with about two small cells near base; rostrum slightly passing the posterior coxæ, first joint about reaching base of head, second extending midway between anterior and intermediate coxæ; third almost passing intermediate coxæ; abdomen beneath obsoletely centrally longitudinally sulcate on the first three segments.

Allied to *Schaefferella*, but apical lateral margins of the scutellum not reflexed, membranal veins not anastomosed, &c.

Herrichella thoracica, sp. n.

Black; anterior two-thirds of pronotum more or less ochraceous; antennæ dark chocolate-brown; head very thickly punctate and obliquely striate; pronotum subrugulose, very coarsely blackly punctate at base, on the pale area equally black coarse punctures arranged sparsely in clusters; scutellum subrugulose and sparsely coarsely punctate, the apical area and lateral margins finely and more thickly punctate; corium thickly punctate; membrane dark cupreous; body beneath thickly punctate, much less so on discal ridge of abdomen and on the posterior lateral margins of the prosternum, which are ochraceous; tarsi brownish ochraceous; other structural characters as in generic diagnosis.

Long., ♀, 15 mm.; exp. pronot. angl. 8 mm.

Hab. Colombia; Dagua (Brit. Mus.).

Paralincus, gen. nov.

Head longer than broad, the lateral lobes longer than the central lobe, passing its apex but somewhat widely separated, their lateral margins moderately reflexed; eyes large, transversely exserted, situate between the insertion of the antennæ and base of head; ocelli wide apart near base; antennæ five-jointed, first joint only slightly passing apex of head, second, third, fourth, and fifth joints almost subequal in

length, each considerably longer than first; antenniferous tubercles distinctly spined; pronotum twice as broad at base as long, the anterior angles shortly spinous, lateral angles subprominent and subacute, lateral margins moderately sinuate, anterior and posterior margins truncate; scutellum as long as head and pronotum together, the apex subangularly rounded; corium with the inner apical margin rounded, membrane with the veins simple, not anastomosed; connexivum exposed from basal half of corium, the segmental angles moderately distinct; rostrum reaching the middle of abdomen, first joint about reaching the middle of prosternum, second joint extending to intermediate coxæ, third joint passing posterior coxæ; basal half of abdomen broadly, obsoletely, centrally, longitudinally sulcate; meso- and metasterna centrally, longitudinally, finely carinate; abdomen beneath moderately convex.

Type, *P. terminalis*, Walk.

Allied to *Lincus*, Stål, from which it differs by the broader and truncate anterior margin of the pronotum and by the short anterior angles of same; from *Phereclus*, Stål, it is to be distinguished by the different structure of the antennæ &c.; from *Ochlerus* it is separated by the length of the lateral lobes of the head.

Paralincus terminalis.

Ochlerus terminalis, Walk. Cat. Het. i. p. 195 (1867).

Hab. Amazons.

Walker writes "lateral lobes not extending beyond the middle one," but this is incorrect; the sanguineous spot to the corium is very distinct; pronotum and scutellum rugulose; corium thickly finely punctate.

Genus Phereclus.

Phereclus, Stål, Stett. ent. Zeit. xxiii. p. 98 (1862).

Type, *P. pluto*, Stål.

Phereclus antennatus, sp. n.

Black or piceous, antennæ with the fourth and fifth joints ochraceous, base of fourth and apex of fifth narrowly black; head with the lateral margins reflexed, the lateral lobes not meeting beyond the central lobe; first joint of antennæ slightly passing the apex of head, second a little shorter than first, third about two and a half times as long as second,

fourth only slightly longer than second, fifth a little shorter than third; pronotum with the lateral margins strongly sinuate, near apex obtusely broadly bispinous, the lateral angles subprominent and broadly subspinous, the disk distinctly rugulose and with two distinct transverse tubercles on the anterior area; scutellum finely punctate, distinctly rugulose near base, at apex the margins moderately reflexed; corium thickly punctate: membrane dark cupreous; body beneath more or less punctate; rostrum reaching the penultimate abdominal segment; tarsi brownish ochraceous.

Long. 10–11½ mm.; exp. pronot. angl. 5–5½ mm.

Hab. Colombia; Cali (Brit. Mus.). Costa Rica; Talamanca (*Pittier*, Coll. Dist.).

Differs from *P. pluto*, Stål, by the different colour of the antennæ and the relative length of the joints, the sinuate lateral margins of the pronotum and the anterior bidentate armature of the same, two anterior callosities to the pronotum, length of rostrum, &c.

Genus Trincavellius.

Trincavellius, Dist. Tr. Ent. Soc. Lond. 1900, p. 103.

Type, *T. galapagoensis*, Butl.

Trincavellius chilensis, sp. n.

Ochraceous, with fine scattered blackish markings; head large, broad, somewhat truncate in front, a little shorter than breadth between outer margin of eyes, the lateral margins obtusely angulate in front of eyes; antennæ ochraceous, first joint short, not reaching apex of head, second distinctly longer than third, which has its apex black (remaining joints mutilated in type); pronotum nearly twice as broad at base as long, the lateral areas laminately ampliate and reflexed, the anterior angles acute, finely granulose, moderately pilose, the anterior lateral margins and central anterior and posterior margins more or less mottled with black; scutellum longer than head and pronotum together, a black spot at each basal angle, basal third moderately convex, remaining area finely speckled with blackish, somewhat thickly finely punctate; corium thickly finely darkly punctate; membrane small, ochraceous, not reaching apex of abdomen; connexivum ochraceous, a black line on each side of the incisures; body beneath and legs ochraceous; head beneath and sternum coarsely darkly punctate, abdomen concolorously punctate; femora darkly speckled and

darkly subapically annulate; spots to abdominal lateral margins and a central longitudinal spot to sixth abdominal segment black.

Long. 7 mm.

Hab. Chili (Brit. Mus.).

Differs from *T. galapagoensis*, Butl., by its smaller size, more acute anterior angles of the pronotum, and more reflexed lateral margins of same; body more elongate and less ovate than in Butler's species.

Trincavellius peruviensis, sp. n.

Brownish ochraceous, finely wrinkled and punctate; head large, broad, about as long as breadth between the outer margins of eyes, the lateral margins distinctly angularly dilated in front of eyes, anterior margin truncately rounded; antennæ with the first joint not reaching apex of head, second very slightly longer than third, third, fourth, and fifth almost subequal in length, the last two joints infuscate; pronotum with the lateral margins oblique, laminately reflexed, a little recurved towards their apices, which are distinctly minutely spined, a subobsolete central longitudinal carinate line; corium scarcely wrinkled but thickly finely punctate; membrane hyaline, very slightly passing abdominal apex; rostrum reaching the posterior coxæ, its apex fuscous; body beneath and legs a little paler than above, minutely speckled with brown; scutellum with a longitudinal brownish spot near apex of lateral margins, the apex itself narrowly ochraceous.

Long. 8 mm.

Hab. Peru; Callao.

Allied to *T. galapagoensis*, Butl., but narrower, head more truncate in front, angle at anterior margin of pronotum more acute, lateral pronotal margins much more oblique, membrane longer, &c.; differs from *chilensis*, Dist., by the broader body, absence of black spots to basal angles of scutellum, longer membrane, &c.

Genus Loxa.

Loxa, Amy. & Serv. Hist. Hém. p. 137 (1843).

Type, *L. flavicollis*, Drury.

Loxa bartletti, sp. n.

Dull pale ochraceous, possibly more virescent in living specimens; eyes and lateral pronotal angles black; first

joint of antennæ reaching apex of head, remaining four joints almost subequal in length; head triangularly narrowed in front, the lateral lobes longer than the central, their apices acutely narrowed, longitudinally ridged and slightly transversely wrinkled; ocelli reddish; pronotum with the lateral margins a little concavely sinuate and distinctly serrate, the lateral angles acutely produced and slightly directed forwardly, the surface finely wrinkled and more obscurely punctate; scutellum finely wrinkled, more distinctly punctate on basal than on apical area; corium thickly finely punctate; membrane hyaline, slightly minutely spotted with ochraceous, considerably passing the abdominal apex; body beneath paler and more shining in hue, legs only slightly paler than surface of body above; rostrum reaching the posterior coxæ and with a black central line above.

Long., ♀, 17 mm.; exp. pronot. angl. $8\frac{1}{2}$ mm.

Hab. Brit. Guiana (*A. W. Bartlett*, Brit. Mus.).

A narrow form of the genus, in that respect resembling *L. variegata*, Dist.

Loxa fryi, sp. n.

Body above olivaceous green, thickly and distinctly punctate; body beneath much paler green; antennæ, rostrum, legs, and a central longitudinal fascia to abdomen ochraceous; head with the lateral lobes longer than the central, distinctly passing but not meeting beyond it, their margins ridged, finely transversely wrinkled, more or less punctate; antennæ with the first joint not reaching apex of head, second longer than first, shorter than third, fourth and fifth subequal in length; pronotum subrugulose and thickly punctate, the lateral margins finely serrate and moderately concavely sinuate, the lateral angles black, short, acute, directed forwardly, the areas of the cicatrices almost impunctate; scutellum finely wrinkled and punctured; corium thickly finely punctate; membrane hyaline and passing the abdominal apex; rostrum reaching the posterior coxæ.

Long. 12 mm,

Hab. Brazil? (Fry Coll., Brit. Mus.).

A small species allied to and resembling *L. variegata*, Dist., but smaller, the lateral pronotal angles shorter and much more anteriorly directed, &c.

Genus Murgantia.

Murgantia, Stål, Stett. ent. Zeit. xxiii. p. 105 (1862).

Type, *M. tessellata*, Amy. & Serv.

Murgantia simulans, sp. n.

Dark metallic blue; lateral, posterior, and subanterior margins of pronotum, the two lateral united by a central longitudinal fascia, a central longitudinal fascia and apex to scutellum, basal lateral margin and a transverse fascia (beyond middle) to corium pale ochraceous; apical margins of membrane somewhat broadly greyish; lateral margins of sternum and abdomen, posterior margin of metasternum and margins of abdominal segments (broadest medially) pale ochraceous; antennæ dark bluish black, second joint slightly longer than first, shorter than third, which is also slightly shorter than fourth (fifth mutilated in typical specimen); head distinctly depressed near base; pronotum distinctly and broadly transversely depressed near middle, sparingly coarsely punctate except on the ochraceous markings, which are impunctate, lateral margins distinctly reflexed; scutellum with the basal third moderately gibbous and very finely wrinkled, remaining area (excluding the ochraceous portions, which are impunctate) thickly coarsely punctate; corium thickly finely punctate; membrane passing the abdominal apex.

Long. 10 mm.

Hab. Peru; Chandramayo (*Rosenberg*, Brit. Mus.).

Allied to *M. bifasciata*, Herr.-Sch., from which it differs by the unicolorous and more broadly rounded head, the ochraceous posterior pronotal margin, the more distinctly gibbous basal area of the scutellum, and the absence of the transverse fascia and the presence of the longitudinal fascia to same; body beneath differently coloured, &c.

Genus Banasa.

Banasa, Stål, Rio Hem. i. p. 24 (1860).

Type, *B. induta*, Stål.

Banasa salvini, sp. n.

Above pale greenish; head, anterior half of pronotum, body beneath, and legs ochraceous; membrane hyaline, passing the abdominal apex; head with a somewhat reddish tint and darkly punctate, excluding the basal half of the central disk it is levigate, impunctate; antennæ greenish, first joint not reaching apex of head, third a little longer than second, slightly shorter than fourth, which is subequal to fifth; pronotum sparingly distinctly punctate, the lateral

margins slightly sinuate, the lateral angles rounded; scutellum slightly wrinkled, sparingly punctate, rather more than basal half slightly purplish in hue; corium thickly, very finely punctate; connexivum ochraceous; rostrum reaching the posterior coxæ, its apex black; apical areas of the posterior femora moderately infuscate.

Long. 13½ mm.

Hab. Guatemala (*O. Salvin*, Brit. Mus.).

Allied to *B. stâlii*, Dist., but differing by the less punctate head, the basal half of the central disk being impunctate, levigate, third joint of antennæ only a little longer than second, lateral margins of pronotum slightly sinuate, different coloration, &c.

I have again used Stål's genus, though in 1880 I referred to the great difficulty with which it could be separated from *Nezara*, a view also advanced by Bergroth in 1891. As, however, it has recently been proposed to use *Banasa* as a distinct subgenus, the name is better treated as previously.

Genus Disderia.

Disderia, Bergr. Entomol. News, xxi. p. 20 (1910).

Type, *D. decorata*, Dist.

Tarsi three-jointed, second joint very small; scutellum "with the apical part moderately broad," the apex not rounded, but subangulate.

D. decorata appears to be widely distributed in Central America. I have previously recorded it from Mexico, Honduras, and Guatemala, and have since received it from Nicaragua.

Genus Oplomus.

Oplomus, Spin. Ess. Hem. p. 355 (1837).

Type, *O. tripustulatus*, Fabr.

Oplomus stellatus, sp. n.

Black, coarsely punctate; anterior and lateral margins (including lateral angles) and three large oblong spots to pronotum, the central spot connected with the anterior margin, a large oblique spot near each basal angle and the apex to the scutellum, apical angle and a small suffusion near middle of costal area to corium, basal spine and basal spot to abdomen beneath, and a lateral segmental series of irregular spots and lateral margins of sternum bright ochraceous;

antennæ black, first joint not reaching head, second joint a little longer, third, fourth, and fifth almost subequal in length; pronotum coarsely punctate, the lateral margins and a central line traversing the central spot levigate, the anterior margin with some scattered very coarse punctures, the lateral angles subprominent and levigate; scutellum somewhat thickly punctate, the oblique basal spots almost impunctate; corium thickly finely punctate; membrane cupreous, passing abdominal apex; abdominal basal spine slightly passing the posterior coxæ.

Long. 9½ mm.; exp. pronot. angl. 5 mm.

Hab. Argentina; Tucuman Prov. (Brit. Mus.).

Oplomus equestris, sp. n.

Pronotum, scutellum, and corium sanguineous; head, narrow lateral margins, and two large irregularly subtriangular spots to pronotum (widest at base), a broad central transverse fascia to scutellum, a large spot a little behind middle of corium, and basal area of membrane black; sternum and legs dark indigo-blue; abdomen beneath pale ochraceous, with transverse marginal spots, a large subapical spot, and the anal segment dark indigo-blue; antennæ black, first joint not quite reaching apex of head, second and third almost subequal in length; head punctate, the lateral areas transversely striate, outer apical angles of the lateral lobes rounded; pronotum somewhat sparsely and coarsely punctate; scutellum with the basal area coarsely sparsely punctate, remaining area more thickly and finely punctate; in the middle a broad central longitudinal carination; corium thickly finely punctate; sternum more or less coarsely punctate; rostrum dark indigo-blue and reaching the posterior coxæ.

Var.—Abdomen beneath sanguineous, not pale ochraceous; corium without the dark spot.

Long. 13 mm.; exp. pronot. angl. 7 mm.

Hab. Centr. Brazil; Chapada (*A. Robert*, Brit. Mus.).

The variety described is in my own collection, but unlocalized.

Allied to *O. marginalis*, Westw.

Parajalla, gen. nov.

Jalla, sect. aa (part.), Stål, En. Hem. i. p. 34 (1870).

Allied to *Jalla*, but differing in the following particulars:—Pronotum with the lateral margins moderately but dis-

tinctly sinuate, the lateral angles a little prominent; scutellum with the apical area broader and the apex more truncate.

Type, *P. sanguineosignata*, Spin.

The structure of the scutellum is the most distinguishing character of this Southern Neotropical genus from the Palæarctic genus *Jalla*. It is also quite distinct from the Australian genus *Jalloides*, in which Schouteden, following Stål, but with doubt and hesitation, placed the typical species.

Parajalla sanguineosignata.

Jalla sanguineo-signata, Spin. in Gay, Hist. de Chile, vii. p. 120 (1852); Sign. Ann. Soc. Ent. Fr. (4) iii. p. 544 (1863).

Jalloides? sanguineonotata, Schout. in Wytsm. Gen. Ins. fasc. lii. p. 42 (1907).

Hab. Patagonia; V. del Lago Xanco (*Chubut*, Brit. Mus.).

The British Museum now possesses four examples of this rare species.

Pseudobebæus, gen. nov.

Head about as long or only slightly longer than breadth at base, the lateral lobes distinctly longer than the central lobe, passing but not meeting beyond it, the apex being thus distinctly cleft; antennæ five-jointed, first joint not reaching apex of head, second very slightly shorter than third, fourth and fifth longest, subequal in length; pronotum more than twice broader between the lateral angles than long, the lateral angles longly broadly produced, the lateral margins serrate, finely near apex, longly towards the produced angles, anterior margin moderately concave, posterior margin truncate in front of scutellum, the lateral margins before the produced angles almost oblique and the disk from the same area sharply obliquely depressed to head; scutellum about as long as broad at base, the lateral margins moderately oblique for about half their length from base and then more longitudinally narrowing to apex, which is subangulate; corium slightly longer than pronotum, the inner apical angle rounded; membrane passing the abdominal apex, the veins mostly longitudinal: rostrum reaching the posterior coxæ, first joint reaching base of head; basal abdominal spine reaching the anterior margins of the posterior coxæ; tarsal joints two in number.

Allied to *Bebæus*, Dall., in general appearance and structure of head and lateral pronotal angles; but lateral pronotal margins strongly serrate, ventral spine only slightly passing posterior coxæ, joints of antennæ different, &c.

Pseudobebœus goyazensis, sp. n.

Brownish ochraceous, speckled and punctured with black; head thickly, darkly, coarsely punctate; antennæ brownish ochraceous, the apical joint a little paler; pronotum ochraceous, darkly punctate, more coarsely and thickly so on anterior and posterior areas, on the paler discal interspace a transverse series of four blackish spots, the broad apices of the produced lateral angles black, rounded and with a short spine anteriorly, concavely sinuate and with a broader spine posteriorly; scutellum blackly punctate, a central, longitudinal, subimpunctate linear marking, not reaching base; corium thickly blackly punctate, a discal, longitudinal, impunctate space a little behind middle; membrane pale fuliginous, the veins much darker; body beneath brownish ochraceous, finely darkly punctate on abdomen beneath, the central longitudinal ridge almost impunctate; sternum more coarsely punctate; apex of scutellum black; structural characters as in generic diagnosis.

Long. 10 mm.; exp. pronot. angl. 9 mm.

Hab. Brazil; Goyaz.

Genus Lanopis.

Lanopis, Sign. Ann. Soc. Ent. Fr. (4) iii. p. 549 (1863).

Type, *L. rugosus*, Sign.

Lanopis chubuti, sp. n.

Body and legs ochraceous; antennæ with the first, second, and third joints magenta-red, fourth and fifth joints (excepting their extreme bases) piceous, first joint slightly passing apex of head, second much longer than third and a little longer than first, fourth and fifth subequal; head coarsely sparingly punctate, the lateral margins a little but distinctly reflexed, lateral and central lobes subequal in length; pronotum about half as long as breadth between the lateral angles, punctate and rugulose, the lateral angles broadly angularly produced, their margins anteriorly convex, posteriorly oblique, their whole marginal area moderately reflexed; scutellum sparingly coarsely punctate, the posterior half with a central longitudinal carination; corium thickly finely punctate, the lateral margins moderately subangularly ampliate, apical margin obliquely straight, membrane dull obscure hyaline, the veins darker, distinctly passing the abdominal apex; sternum coarsely punctate;

posterior angles of abdominal segments at lateral margins distinctly prominent, tumescent; rostrum reaching the intermediate coxæ, its apex black; abdomen above testaceous red.

Long. 10–11 mm.; exp. pronot. angl. $5\frac{1}{2}$ mm.

Hab. Patagonia; V. del Lago Xanco (*Chubut*, Brit. Mus.).

Allied to *L. rugosus*, Sign., but larger, lateral angles more produced, colour of antennæ and body above different, &c. From *L. testaceus*, Reed, a species I have not seen, it differs by the totally different antennæ &c.

Lanopis splendens, sp. n.

Ochraceous; head (excluding large basal spot), two oblique discal longitudinal fasciæ to pronotum, which are a little widened posteriorly and more distinctly so at anterior margin, scutellum (excluding apical area and corium) more or less carmine-red; antennæ with the basal joint carmine-red, second and third joints ochraceous, fourth and fifth (excluding their extreme bases) piceous, first and third subequal in length, second a little longest, fourth and fifth subequal; head sparingly punctate, the lateral lobes slightly longer than the central, the former with their margins slightly reflexed; pronotum strongly rugulose and punctate, the lateral angles very much as in *L. chubuti*, the anterior angles shortly distinctly obtusely angulate; scutellum coarsely punctate, apical half distinctly centrally longitudinally carinate; corium thickly finely punctate, the lateral margins slightly subangularly ampliated, apical margins obliquely straight; membrane dull ochraceous, subhyaline, the veins a little darker, distinctly passing the abdominal apex; body beneath and legs ochraceous; abdomen beneath and legs sprinkled with carmine-red; sternum coarsely punctate; rostrum reaching the intermediate coxæ, its apex black; abdomen above carmine-red, posterior angles of abdominal segments at lateral margins distinctly prominent, tumescent.

Long. $10\frac{1}{2}$–11 mm.; exp. pronot. angl. $5\frac{1}{2}$–6 mm.

Hab. Patagonia; V. del Lago Xanco (*Chubut*, Brit. Mus.).

Genus Planois.

Planois, Sign. Ann. Soc. Ent. Fr. (4) iii. p. 548 (1863).

Type, *P. bimaculatus*, Sign.

Planois patagonus, sp. n.

Ochraceous, thickly punctate; two small spots on anterior

area of pronotum and the posterior sublateral margins of same, basal lateral margins of scutellum (widened near basal angles), and clavus more or less sanguineous ; corium on apical area suffused with blackish ; connexivum pale ochraceous, with large black spots ; membrane greyish, subhyaline, not passing the abdominal apex ; body beneath and legs ochraceous, lateral areas of sternum and abdomen pale sanguineous ; antennæ ochraceous, first joint longly passing apex of head and about as long as the head itself, second and third subequal in length, apex of third black, remaining joints mutilated in typical specimen ; head sparsely punctate and very finely transversely striate, the lateral margins reflexed ; pronotum thickly somewhat finely punctate, the lateral margins oblique, very slightly sinuate, the lateral angles subprominent, rounded, and with their margins black ; scutellum somewhat sparsely punctate and with a subobsolete pale longitudinal levigate line ; corium thickly punctate ; abdomen beneath sparsely very finely punctate, and with a central longitudinal dark fasciate line ; rostrum reaching the posterior coxæ, with its apex black ; odoriferous apertures shortly produced.

Long. 13 mm.

Hab. Patagonia ; V. del Lago Xanco (*Chubut*, Brit. Mus.).

Differs from *P. bimaculatus*, Sign., in having the second joint of the antennæ scarcely longer than the third, absence of the pale spot to corium, &c.

Ea, gen. nov.

Moderately flat, subovate ; head about as broad between the eyes as long, lobes of equal length, but the apices of the lateral lobes a little obliquely directed to the central, which makes the latter appear slightly prominent ; ocelli near base, much nearer to eyes than to each other ; antennæ five-jointed, basal joint robust, slightly passing apex of head, second joint slightly longest, third short, about equal to first, fourth and fifth subequal, each a little shorter than second ; pronotum about half as long as broad at base, lateral margins roundly oblique, very slightly sinuate, lateral angles rounded, not prominent, anterior margin concavely sinuate, anterior angles slightly angularly prominent, basal margin almost truncate ; scutellum longer than broad, obliquely narrowed to apex, which is subangulate, a little longer than pronotum ; corium about as long as scutellum and pronotum together, the apical margin straightly oblique ; membrane scarcely passing the abdominal apex, veins longi-

tudinal, not anastomosed; rostrum reaching the posterior coxæ, first joint about reaching base of head, second extending to nearly the anterior coxæ; basal abdominal spine distinct, not passing the posterior coxæ; odoriferous apertures distinct, transverse, about as long as coxæ and trochanters together; femora moderately incrassate, tarsi two-jointed, first joint a little shorter than second.

A genus apparently to be placed near *Hellica*, Stål, and *Sniploa*, Sign.

Ea australis, sp. n.

Olivaceous green, thickly, coarsely, darkly punctate; antennæ, rostrum, body beneath, and legs ochraceous; transverse lateral spots to pro-, meso-, and metasterna, lateral marginal abdominal spots inwardly preceded and united to an irregular longitudinal submarginal fascia, carmine-red; margins of head and pronotum and basal lateral margins of corium very narrowly and obscurely ochraceous, the margins of the pronotal lateral angles narrowly black; head with the lateral lobes distinctly transversely striate; pronotum, scutellum, and corium distinctly rugulose as well as coarsely punctate; pronotum and scutellum with an obscure central longitudinal linear ridge; membrane ochraceous, with a central and apical castaneous suffusion; connexivum ochraceous, with large black spots; other structural characters as in generic diagnosis.

Long. $10\frac{1}{2}$–11 mm.

Hab. Patagonia; Valle del Lago Blanco (Brit. Mus.).

Synonymical Notes.

I take this opportunity for substituting new names for some that have proved to be preoccupied.

Neocensorinus, n. nom.

Censorinus, Dist. Ann. & Mag. Nat. Hist. (8) vi. p. 598 (1910), nom. præocc.

Aspongopus circumclusus, n. nom.

Aspongopus circumcinctus, Dist. Ann. & Mag. Nat. Hist. (8) vi. p. 221 (1910), nom. præocc.

Penthimia reticulosa, n. nom.

Penthimia reticulata, Dist. Ann. Soc. Ent. Belg. 1908, p. 108, nom. præocc.

XXIX.—*On the Cirrhitiform Percoids.*

By C. Tate Regan, M.A.

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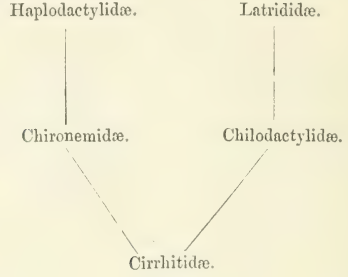
Dr. Günther included in the family Cirrhitidæ a number of Perch-like fishes with the lower pectoral rays simple and with the pelvic fins rather far behind the pectorals. *Haplodactylus*, which resembled the Cirrhitidæ in these features, was placed by him in the Sparidæ on account of its different dentition, the teeth being compressed instead of villiform.

After making a detailed study of these fishes, I conclude that the Cirrhitidæ of Günther, with the addition of *Haplodactylus*, are a natural and well-defined group which might almost be regarded as a single family with five subfamilies, but which it is, perhaps, better to recognize as a division—Cirrhitiformes—of the suborder Percoidea of the order Percomorphi.

The Cirrhitiform Percoids have the following characteristics:—Body scaly; lateral line complete, continuous, nearly straight. Spinous dorsal well developed; 3 anal spines; caudal of 15 principal rays, all or 13 branched; pectorals with the lower 5 to 8 rays simple; pelvics rather far behind the pectorals, each of a spine and 5 branched rays, without scaly axillary process. Two nostrils on each side. Gill-membranes united, free from the isthmus; 3 to 6 branchiostegals; 4 gills; pseudobranchiæ. Last 3 upper pharyngeals toothed; lower pharyngeals separate. Præmaxillaries with ascending pedicels of moderate length; maxillary ramus expanded distally, without supramaxillary; præorbital expanded; præoperculum subcrescentic; operculum rather deep, with the free posterior edge more or less concave between two obtuse or acute prominences; subopercular long and narrow, projecting beyond operculum; hyo-palatine bones typically Percoid; parietals separated by supraoccipital; a basisphenoid; alisphenoids not in contact. Skull more or less compressed, rather elevated posteriorly; upper surface flattish or somewhat convex; occipital crest not extending forward on frontals; parietal crests vestigial or absent; exoccipital condyles contiguous. Post-temporal forked; upper post-cleithrum laminar, lower slender; lower part of cleithrum much expanded antero-posteriorly, meeting its fellow in a long carinate symphysis; cleithra also with broad transverse laminar expansions; hypercoracoid perforate, hypocoracoid with an inferior process

which is truncated distally, where it joins the cleithrum above the symphysis ; 4 radials, the lower rather strongly enlarged and with large foramina between them, the lowest and part of the next inserted on the hypocoracoid. Pelvic bones elongate. Vertebræ 26 to 35 ; ribs and epipleurals inserted together, on parapophyses when these are developed.

Five families may be recognized, and their relations may be expressed thus :—



1. Cirrhitidæ.

Dorsal X 11–14. Anal III 6–9. Simple rays of the pectoral more or less thickened and produced. Mouth terminal, protractile ; villiform teeth in jaws and on vomer, sometimes on palatines ; jaws formed as in the Serranidæ, the præmaxillary rami with posterior expansions, the maxillaries exposed, broadest distally. A broad subocular shelf. Occipital crest moderate, commencing behind or above the posterior part of the orbit; parietal crests feeble or absent ; frontals with well-marked supraorbital flanges. Vertebræ 26 to 28 (10 + 16–18) ; præcaudals with parapophyses from the fourth or fifth ; 1 to 3 ribs sessile.

Genera : *Isoluna*, *Cirrhites*, *Cirrhitichthys*, *Oxycirrhites*.

2. Chironemidæ.

Dorsal XIV–XV 16–18. Anal III 6–7. Villiform or conical teeth in jaws and on vomer. Præmaxillary rami with posterior expansions vestigial or absent ; maxillary with a strong posterior expansion just below its palatine articulation. No subocular shelf. Occipital crest very short, developed only on the posterior surface of the skull ; no parietal crests. Vertebræ 33 (13 + 20) ; præcaudals with para-

pophyses from the fourth or fifth; 1 or 2 ribs sessile. In other characters similar to the Cirrhitidæ.

Two genera: *Chironemus* and *Threpterius*.

3. Haplodactylidæ.

Dorsal XV–XVII 18–21. Anal III 6–8. Mouth transverse, subterminal, not or scarcely protractile; jaws with bands of lanceolate or tricuspid incisors; teeth on the vomer. Jaws, head skeleton, &c. as in *Chironemus*, except that the frontals have no definite supraorbital flanges. Vertebræ 35 (16+19); all the præcaudals with parapophyses; no sessile ribs.

A single genus, *Haplodactylus*, scarcely differing from *Chironemus*, except in the mouth and dentition, and the greater development of the parapophyses.

4. Chilodactylidæ.

Dorsal XVI–XIX 23–33. Anal III 7–19, considerably shorter than the soft dorsal. Mouth, jaws, and dentition as in the Cirrhitidæ, except that the maxillary ramus has a strong posterior expansion just below its palatine articulation and there are no teeth on the palate. Skull as in the Cirrhitidæ; subocular shelf well developed. Vertebræ 35 (14+21); in the præcaudal region expanded laminæ at the bases of the neural spines; all the præcaudals with parapophyses; no sessile ribs.

Chilodactylus and *Nemadactylus* differ from the Cirrhitidæ only in the increased number of vertebræ and fin-rays, the absence of vomerine teeth, the form of the maxillary, and the structure of the præcaudal vertebræ.

5. Latrididæ.

Dorsal XVII–XXIII 24–39. Anal III 18–32, nearly as long as soft dorsal. Simple pectoral rays feeble, not produced. No subocular shelf. Vertebræ 35 (14+21).

Latris and *Mendosoma*, in other characters similar to the Chilodactylidæ.

From the above it will be seen that I am not in agreement with the views of Boulenger *, who, in 1896, redescribed *Threpterius maculosus*, Richards., and offered some remarks on the systematic position of the genus *Threpterius* and others

* Ann. & Mag. Nat. Hist. (6) xviii. p. 398.

which had been placed in its neighbourhood and whose relations he thought had been misunderstood. He wrote that an examination of the skeletons showed the family Cirrhitidæ of Günther to be a most artificial group, and that if a natural arrangement were to be attempted the only way to deal with it would be to disband it altogether. He then proposed to place *Cirrhites* in the Serranidæ; *Chilodactylus* was to join *Haplodactylus* in the Sparidæ, and a distinct family, Latrididæ, was established for *Chironemus, Threpterius*, and *Latris*. The presence or absence of a subocular shelf and of parapophyses on the anterior vertebræ were apparently the only characters taken into consideration in this arrangement. That *Chilodactylus* has and *Haplodactylus* has not a subocular shelf was apparently overlooked, and *Latris*, which resembles these genera and differs from *Chironemus* and *Threpterius* in having parapophyses on all the præcaudal vertebræ, was evidently associated with the latter owing to an error in the tabular statement of the structure of the vertebral column.

In the 'Cambridge Natural History' (1904) the Cirrhitinæ form a subfamily of the Serranidæ; the Latrididæ include only *Latris*, and are placed next to the Haplodactylidæ, comprising *Haplodactylus*, *Chilodactylus*, *Chironemus*, and *Threpterius*; parapophyses are said to be developed from the third or fourth vertebra and a subocular shelf to be absent; neither of these statements is true of all the genera.

The presence or absence of a subocular shelf and the development of parapophyses have some taxonomic importance; but other characters—for example, the number of anal spines and the presence or absence of a pelvic axillary process—are equally useful in classifying the Percoids. Apparently the subocular shelf has been lost twice and parapophyses have been twice independently developed on the anterior præcaudal vertebræ, within the limits of a single small and uniform group, the Cirrhitiformes.

XXX.—*New Species of Heterocera from Costa Rica.*—VI.

By W. Schaus, F.Z.S.

Heorta mitis, sp. n.

♂. Head and collar lilacine buff. Thorax pale greenish and light brown, irrorated with fuscous-brown scales. Abdomen above fuscous grey; a dorsal tuft of brown scales at

base. Fore wings dull greenish grey, shaded with brown in cell and on inner margin; three fine black streaks on costa at base, and others more remote from base below cell; antemedial fuscous points on veins; a geminate fine curved medial line, the inner part punctiform on veins; an oblique pale shade across end of cell; a black point anteriorly on discocellular; a geminate postmedial line, very indistinct, forming a lunule between 6 and 4, and punctiform on veins below, followed by fuscous-brown shades between 3 and 6; a subterminal, wavy, velvety black line from costa to vein 4, thickening somewhat between the veins, followed by fuscous-grey shades on veins; marginal black lunules between the veins; terminal fuscous spots between veins extending on cilia, and interrupting a terminal black line. Hind wings fuscous; cilia whitish.

Expanse 37 mm.

Hab. Juan Vinas, Sixola.

Bardaxima hippioides, sp. n.

Palpi whitish buff in front, with a lateral dark streak, violaceous brown behind. Frons and tufts in front dark violaceous; tufts behind and vertex whitish buff. Collar mottled buff and reddish brown. Thorax dark violaceous brown. Abdomen fuscous brown; a velvety dark brown tuft dorsally at base. Fore wings dark violaceous brown; the base dull brown, with a short dark velvety streak and some white scales below cell; antemedial dull brown, edged in places with dark scales, outset on subcostal and just above median, preceded below cell by a patch of greenish scales; a dull brown shade on discocellular, crossed by a velvety dark brown lunule and followed by a wedge-shaped velvety spot, above which is a white streak along vein 5, limited by a white transverse line from 5 to 6, both edged with dark brown; from above streak a light brown shade oblique to apex, becoming creamy buff between 7 and 8; dark brown streaks between 5 and 7, outwardly limited by buff lunules; marginal velvety spots, edged with light brown; cilia fuscous, with light brown points at veins. Hind wings fuscous.

Expanse 45 mm.

Hab. El Sitio, Cartago.

Antiopha excelsa, sp. n.

♀. Palpi, head, and collar fuscous brown, the vertex mottled with lilacine and reddish brown. Thorax and patagia lilacine brown. Abdomen above fuscous. Fore wings: the

costal margin for two-thirds from base, the base, and basal half of inner margin fuscous grey, streaked with dark brown; the cell and beyond it lilacine, streaked with reddish brown; the apical third of costal margin reddish brown; outer portion of inner margin greyish brown, with oblique reddish-brown streaks between submedian and vein 2; along median and vein 3 to outer margin a broad fuscous-brown shade; the outer margin tinged with fuscous grey; the reddish-brown streaks between veins geminate and subterminal lines between them bifurcating towards termen and enclosing marginal white points; some postmedial white points from vein 6 to costa. Hind wings fuscous, somewhat whitish at base; cilia fuscous brown at base, greyish terminally.

Expanse 53 mm.

Hab. Avangarez.

Poresta punctulum, sp. n.

♂. Palpi grey in front, brown behind, and with a lateral black streak. Head: frons light brown; vertex ochreous buff; tufts dark brown and grey. Collar and thorax ochreous buff, partly shaded with dark brown; patagia dark grey. Abdomen fuscous grey, terminally shaded with reddish brown. Fore wings reddish brown; a white line from near base of costa oblique to near submedian and parallel with it to termen, below the line the base and inner margin is greenish grey irrorated with fuscous; a black point on discocellular; the costal margin finely pale; a black line outwardly shaded with dark violaceous from apex to white line medially; the outer margin shaded with violaceous; marginal black points between the veins slightly shaded with grey, a curved terminal line between veins 2 and 3, outwardly filled in with white and grey. Hind wings fuscous; a whitish-buff streak along inner margin.

Expanse, ♂ 41, ♀ 54 mm.

Hab. Juan Vinas, Tuis.

Allied to *P. thermesia*, Felder.

Dasylophia nigrescens, sp. n.

♀. Palpi, head, and tufts dark brown, the latter shaded with whitish. Collar and thorax black. Abdomen light brown; a greyish dorsal line. Fore wings greyish brown; the basal third black, with a black-brown streak in cell and above submedian, and followed by a lighter brown shade, and black medial line in cell, and below cell by the dark medial line and a white shade; the postmedial fuscous,

geminate, wavy, incurved to submedian fold, then outcurved, with a velvety dark spot just below vein 2, and a similar line between 2 and 3; a subterminal black shade very broad on costa, narrowing to a point at vein 2, with velvety streaks between the veins, which are followed by angled brown lines inwardly shaded with buff; a dark point at lower angle of cell; a terminal black line preceded by grey irrorations. Hind wings whitish; the veins on outer half dark brown; the margins fuscous shaded.

Expanse 45 mm.

Hab. Avangarez.

A male similar to this female is in the National Museum, Washington, from Cuernavaca, Mexico.

Dasylophia placida, sp. n.

♂. Palpi and head brown; tufts on head, thorax, and patagia lilacine brown. Collar dark violaceous brown. Abdomen light brown. Fore wings light brown, faintly tinged with lilacine, and with grey on outer half of inner margin; black irrorations on veins; some faint darker streaks at base; a faint dentate antemedial shade; a medial shade, inwardly very oblique from submedian fold to submedian vein, and there preceded by a fine reddish-brown shade; a velvety black spot at lower angle of cell; a geminate postmedial wavy fuscous shade, incurved below vein 4, the two lines well apart, the outer one followed by a pale shade, and some reddish brown above and below vein 2; a subterminal fuscous shade with dark streaks between veins 4 to 8, and fuscous spots between 2 and 4, the dark streaks followed by buff streaks; a terminal dark lunular line, the points extending on cilia. Hind wings whitish; the veins on outer half and margins fuscous.

Expanse 40 mm.

Hab. San José, Avangarez.

Allied to *D. guarana*, Schs., but the antennæ in the female of *placida* are simple, whereas in *guarana* they are pectinated.

Dasylophia indecoris, sp. n.

♂. Antennæ pectinated to near tips. Palpi, head, and patagia dark lilacine grey; a dark brown lateral line on palpi; collar dark brown. Abdomen grey-brown. Fore wings grey-brown; the cell and costal margin broadly shaded with fuscous brown; an oblique fuscous shade from costa antemedially to end of cell, angled and inwardly oblique to inner margin; a pale postmedial shade on costa; median vein

greyish buff edged with reddish brown; veins 2–4 and 5–7 terminally with fine fuscous streaks, edged with greyish buff; geminate brown streaks coalescing partly between veins 4–8; subterminal and terminal fuscous spots between veins 2–4. Hind wings fuscous brown, tinged with white at base, in and just beyond cell.

Expanse 38 mm.

Hab. Cachi.

Allied to *D. seriata*, Druce.

Dasylophia angustipennis, sp. n.

♂. Frons and collar buff-brown; vertex and thorax reddish brown; patagia violaceous brown; tufts at base of antennæ greyish brown. Abdomen above greyish brown, with dark irrorations terminally. Fore wings brown; base of costa and inner margin buff; a very oblique reddish-brown shade from costa across middle of cell, incurved and finely dentate to inner margin, followed by a fine geminate fuscous line from vein 2, sharply oblique towards base from submedian fold, punctiform at fold and vein 2; postmedial space below 4 to tornus shaded with grey; veins 4–7 dark brown; geminate fuscous and brown streaks from cell to termen and subterminal buff streaks between veins 4–8; traces of a curved postmedial line, followed by a white and black spot between 2 and 3; a subterminal lunular buff line edged with reddish brown between 2 and 4. Hind wings white; veins terminally, inner margin broadly, and apex slightly irrorated with fuscous.

Expanse 46 mm.

Hab. El Sitio, Juan Vinas.

Wings longer and narrower than usual.

Arhacia corina, sp. n.

♂. Palpi, head, collar, and thorax violaceous brown; palpi tipped with buff; a geminate dorsal whitish streak from antennæ to tips of patagia. Abdomen fuscous brown; a dorsal tuft at base mottled brown and white. Fore wings: a broad brownish-black shade from base of costa through cell and just below it to near termen between 4 and 6, on which the veins are still darker streaked; a buff shade above this along costa and below vein 7 to near termen with some brown streaks; the apical third of costa above vein 7 shaded with lighter brown; below dark shade the wing is lilacine brown; an outcurved dark geminate antemedial line; a faint postmedial line also geminate; a subterminal fuscous-brown

shade darkest from below vein 2 to vein 4; an olive-brown terminal line cut by veins and preceded by a buff line; cilia buff, with darker spots at veins. Hind wings whitish; the margins and veins terminally fuscous brown.

Expanse 35 mm.

The female has the hind wings entirely fuscous brown, the cilia whitish buff.

Expanse 42 mm.

Hab. Juan Vinas, Tuis.

Cerura laqueata, sp. n.

♂. Head white, edged with black laterally; a black spot on vertex. Collar white, edged with black in front and behind. Thorax white, streaked with black. Abdomen white at base and terminally, otherwise fuscous grey with whitish transverse lines; a postmedial black line on last segment. Fore wings silvery white, the markings black; basal and subbasal lines to submedian; antemedial and medial lines parallel, wavy, indentate on submedian, outbent to inner margin; the cell-spot large, formed by a heavy incurved line on medial side, outwardly straight between 2 and 3, obtusely projecting between 3 and 4, incurved between 4 and subcostal; a geminate lunular postmedial line, followed on costa by a thicker line; marginal oblique black lines from 6 to termen of 4, 4 to 3, 3 to 2, and 2 to tornus terminating in spots on cilia; from apex to vein 6 a straight line. Hind wings white; a fuscous patch at apex; some fuscous hairs on inner margin; a few fuscous irrorations on outer margin; dark points on cilia.

Expanse 34 mm.

Hab. Sixola.

Lirimiris imitans, sp. n.

♂. Palpi and frons reddish brown, irrorated with white; vertex whitish buff, shaded with light brown; collar brown; patagia brown, edged with buff. Abdomen grey-brown above; a dark reddish-brown dorsal tuft at base; terminal segment and anal hairs buff, streaked with pale reddish brown. Fore wings buff tinged with pale brown, and longitudinal brownish streaks from base; a geminate dark reddish-brown streak from base below cell to middle, followed by a broad olive-brown shade, terminating at a small cluster of black scales between veins 3 and 4; an olive-grey streak near base above submedian; the costal and inner margins reddish brown, with darker streaks, from a little beyond base;

the outer margin narrowly dark olive-green, preceded by a light buff shade, followed by a fine whitish and a fine black line, and terminally as well as cilia reddish brown crossed by a darker brown line; transverse whitish and pale reddish-brown lines at end of cell. Hind wings brown, the costal margin and anterior portion of cell yellowish white; a marginal darker brown shade, divided by a wavy buff line on inner half; a terminal pale shade, divided by a darker brown line, becoming black near anal angle.

Expanse 57 mm.

Hab. Sixola.

Fore wings similar to *Arhacia combusta*, H.-S.; hind wings differ in colour and in having veins 3 and 4 well apart.

Dicentria patula, sp. n.

♂. Palpi, head, collar, and patagia brown; a fuscous spot on vertex; thorax fuscous and dark brown. Abdomen above fuscous; the terminal segment and anal hairs fuscous and buff. Fore wings: basal half of costa, cell, and a shade along submedian to termen dull violaceous grey; a velvety dark brown streak at base below cell, and a similar streak on discocellular, followed by a brown shade; an olive-brown shade below cell; a broad curved postmedial buff shade from costa to vein 2, divided by an interrupted fine brownish line; vein 5 edged with dark brown to termen; a subterminal dark brown space above vein 2, extending to termen on vein 3, with a buff spot below 3; vein 4, 6 to costa, and apex pale olive-brown, with some terminal buff streaks. Hind wings whitish; fuscous hairs along inner margin; the veins light brown, becoming darker terminally.

Expanse 41 mm.

Hab. Cartago, Juan Vinas; Volcano Turrialba, 5800 feet.

Dicentria missilis, sp. n.

♂. Head, collar, and thorax fuscous, mottled with grey and light brown. Abdomen above fuscous brown, darkest dorsally at base. Fore wings light brown, tinged with buff in and below cell and on outer margin between 3 and 6; a velvety black-brown streak on discocellular, followed by a long similar streak between veins 4 and 5; vein 5 terminally broadly olive-brown; veins 3, 4, and 6 finely dark brown; a subterminal dark brown shade between veins 2 and 3; a dark shade at base of veins 2–4; a dark streak from base below cell to antemedial line, which is fine olive-brown, forming three outward curves; a whitish marginal spot

between veins 2 and 3; an indistinct subterminal line, punctiform on veins; cilia whitish buff and brown. Hind wings white, the veins and margin irrorated with fuscous hairs; a fuscous streak near inner margin.

Expanse 31 mm.

Hab. Sixola, Juan Vinas.

Allied to *D. stridula*, Schs., and *D. disparilis*, Schs.

Dicentria rivalis, sp. n.

♂. Palpi buff, a fuscous-brown patch laterally. Head and thorax mottled brown and fuscous. Abdomen above fuscous, the terminal segments buff and brown. Fore wings buff-brown, shaded with pale reddish brown on inner margin; a dark brown space at base of costa and cell; a pale line on either side of discocellular, preceded in cell by a dark shade and followed by a dark brown streak from between 4 and 5 obliquely across vein 5; antemedial line faintly indicated; small postmedial geminate streaks on veins; subterminal fuscous spots above vein 6; a dark brown space on outer margin from vein 2 to above vein 3; veins terminally fuscous; terminal brown spots between veins; fuscous spots on cilia at veins. Hind wings white, some terminal brown scales; a fuscous shade at anal angle.

Expanse 35 mm.

♀. Fore wings greyer; the lines and spots more distinct; the spot on discocellular oval, whitish grey, with dark centre; a geminate dark wavy line before cell-spot; a curved dentate fuscous line just beyond cell; the postmedial very oblique on costa and finely dentate, geminate; the subterminal spots larger. Hind wings: the veins terminally and outer margin fuscous.

Expanse 44 mm.

Hab. Juan Vinas, Guapiles.

Allied to *D. palmita*, Schs.

Dicentria rustica, sp. n.

♂. Head and thorax mottled grey-brown and fuscous; frons shaded with buff. Abdomen above black; a buff space dorsally on last two segments; underneath whitish buff; a black ventral space at base; the legs fringed with long black hairs. Fore wings dull brown, irrorated with fuscous brown, especially at base, on inner margin, and above tornus; a fuscous shade at end of cell; antemedial very indistinct, fuscous; fine fuscous streaks between veins beyond cell; postmedial black points on veins; veins dark brown;

subterminal fuscous spots between veins shaded with buff near tornus. Hind wings white; fine terminal fuscous irrorations; a fuscous-brown streak near inner margin from base, ending in a fuscous shade at anal angle. Underneath white. Fore wings: the veins on terminal half fuscous; the postmedial area shaded with fuscous above vein 4; a subterminal dentate fuscous shade; sagittate fuscous spots on veins terminally. Hind wings: a small fuscous shade at anal angle.

♀. Fore wings rather darker, the markings very confused. Hind wings fuscous; the basal area in and below cell shaded with white; a curved whitish line above anal angle.

Expanse 45 mm.

Hab. Sixola, Juan Vinas.

Dicentria tacita, sp. n.

Palpi, head, and collar medially brownish buff; collar otherwise, and thorax mottled brown and fuscous. Abdomen above fuscous brown, the terminal segments whitish buff. Fore wings brown, irrorated with fuscous at base, below cell and vein 2, and on outer margin between veins 2 and 4; traces of dark brown lines between the veins beyond cell; marginal white spots at tornus and between veins 2 and 4; black marginal spots between veins 6 and 8. Hind wings white; some brownish scales terminally; a fuscous-brown shade along inner margin.

Expanse 34 mm.

Hab. Sixola.

Dicentria limosoides, sp. n.

♂. Head, collar, and thorax mottled light brown and fuscous; some silvery white scales on patagia. Fore wings brown; the costal margin, apex, and cell paler, shaded with olive-green and pale buff; an olive-green spot at end of cell, edged with whitish; postmedial line geminate, dentate, lunular and punctiform on veins, rather indistinct; no streaks between the veins; elongated subterminal fuscous spots, outwardly shaded with white on costa and at tornus; veins broadly tipped with black. Hind wings white; a terminal brown line; veins terminally shaded with brown; a fuscous shade at apex; a fuscous line near inner margin; anal angle fuscous.

Expanse 32 mm.

♀. The markings more distinct; a geminate antemedial line; the subterminal spots all shaded outwardly with buff. Hind wings whitish; the margins broadly fuscous.

Expanse 42 mm.

Hab. Juan Vinas, Sixola.

Very closely allied to *Dicentria* (*Meragisa*) *limosa*, Schs.

Psilacron arthuri, sp. n.

♂. Head, collar, and thorax mottled greenish buff and brown; a black-brown transverse line on collar. Abdomen fuscous above; basal tufts greenish buff; terminal segment and anal hairs buff. Fore wings: some greenish buff at base, and a black point below cell followed by a fuscous-grey shade limited by the antemedial line, which is fine, black-brown, geminate, somewhat oblique from costa to submedian, then incurved; medially and below vein 4 grey, with darker irrorations; a greenish-buff shade between 3 and 4 near cell, above submedian medially, and about tornus; a small brown spot on discocellular, followed by a curved brownish shade consisting of short streaks; postmedial geminate, interrupted, forming short velvety streaks on veins, followed between veins 4–7 by a large fuscous-grey shade; a marginal dark grey shade from costa to vein 4; a terminal olive-brown line; terminal black streaks on veins; cilia whitish, with fuscous spots. Hind wings fuscous grey, the veins and inner margin darker; a geminate postmedial line on costa filled in with greenish buff.

Expanse 37 mm.

♀. Fore wings olive-brown, shaded with fuscous and dark grey, the lines as in the male; a large whitish patch on outer margin from vein 2 to just above vein 4. Hind wings with indistinct medial and geminate postmedial fuscous lines.

Expanse 41 mm.

Hab. Juan Vinas.

Psilacron discolor, sp. n.

♂. Head, collar, and thorax mottled brown and greenish. Abdomen above greyish brown; dorsal greenish tufts at base. Fore wings yellowish green, probably faded, shaded with fuscous grey in and below cell medially; a subterminal dull fuscous-grey shade from vein 4–7; a large antemedial black space from below cell to inner margin; a velvety black semilunar spot at end of cell, and an inward fuscous shade below it; a fine incurved dark line from costa before subterminal shade to vein 3, geminate from vein 7–3; a subterminal fuscous shade between veins 2 and 3; a paler marginal line, lunular below vein 4. Hind wings brownish, tinged with fuscous grey.

Expanse 41 mm.

The female has the outer margin broadly shaded with white between veins 2 and 4.

Expanse 47 mm

Hab. Juan Vinas, Tuis

This species may prove to be a variety of *P. roberti*. Schs. it is readily distinguished by the discal spot and black antemedial spaces.

Heterocampa altilis, sp. n.

♀. Head, collar, and thorax mottled green and fuscous brown. Abdomen fuscous grey, with dark velvety scales at base. Fore wings: from base to tornus, end of cell, and slightly beyond on costa dull green and brown, with some fuscous shadings antemedially; inner margin finely brown-black; a fine black medial line forming three outward curves and inwardly shaded with dull green; a buff streak on discocellular, outbent anteriorly and divided by a fine black line; a geminate white postmedial line on costa; from beyond cell and from vein 2 to costa a large greyish-black space almost reaching termen, on which veins 2–6 are brown-black, and there are intervenal dark brown streaks except between veins 3 and 4, and also a postmedial and subterminal dark brown shade, the latter limiting the dark streaks; between veins 3 and 4 an ovate space containing a whitish streak along vein 3 and some green shadings; a marginal green shade outwardly edged by a fine black line; termen brownish, with a terminal dark line. Hind wings fuscous brown; a faint postmedial pale line.

Expanse 44 mm.

Hab. El Sitio.

Heterocampa apparata, sp. n.

♂. Palpi fuscous brown, fringed in front with light brown. Head greenish brown; a darker shade on vertex. Collar and thorax violaceous brown, the former tipped with dark green; patagia and dorsal tuft at base of abdomen dark green. Abdomen fuscous brown; the anal hairs yellowish green. Fore wings apple-green; a geminate black basal line on costa; a black streak below cell at base; antemedial line fine, black, geminate, lunular, preceded by a brown spot on costa, and a similar space below cell to inner margin; bluish-white irrorations on costa medially, and an oblique patch of similar scales between veins 2 and 3 from discocellular, preceded below end of cell by some dark green

scales; discocellular light brown, edged with velvety fuscous brown; a fuscous geminate medial line on costa and a single black medial line from vein 2 to inner margin; postmedial fine, black, indistinct, lunular and oblique to vein 3, then incurved and lunular, followed between 4 and 7 by some scattered black irrorations; a subterminal wavy black shade; base of cilia yellowish. Hind wings fuscous grey, tinged with lilacine; a dark postmedial line on costa, followed by a whitish spot; cilia green.

Expanse 39 mm.

Hab. Tuis.

Heterocampa delecta, sp. n.

♂. Head, collar, and thorax olive-green. Abdomen above fuscous grey. Fore wings olive-green, strongly shaded with white on outer half of costal margin and beyond cell; an oblique geminate basal fuscous line, filled in with brown above cell; a wavy geminate antemedial fuscous line, rather indistinct; a fuscous medial line, outwardly edged with white on costa, interrupted by a brown line on discocellular; the postmedial from vein 7, lunular fuscous and brown, spotted with white on veins 2–7; a faint dentate brownish subterminal shade. Hind wings fuscous grey; a geminate dark postmedial line on costal margin, followed by a large white space at apex.

Expanse, ♂ 35, ♀ 45 mm.

Hab. Juan Vinas, El Sitio.

Heterocampa dolorosa, sp. n.

Palpi brown, tipped with grey. Frons light brown. Thorax black-brown, mottled with grey; a white patch on patagia. Abdomen dorsally brown, a darker patch at base; terminal segments shaded with white. Legs and body below greyish brown. Fore wings fuscous brown; a large whitish space from base of costa to medial, extending to submedian on inner margin, inwardly limited by an oblique basal brown shade and outwardly by the medial, which is outcurved around end of cell and dentate below submedian fold; the antemedial geminate, black, inbent on subcostal and submedian, only faintly marked above median; a black point in cell; a brown lunule on discocellular; postmedial black, geminate, lunular, divided by greyish lunules; a subterminal fuscous dentate line, outwardly partly shaded with whitish, suffusing with marginal whitish spots between veins 2 and 4; cilia whitish, spotted with fuscous. Hind wings white;

geminate fuscous postmedial lines on costa and a spot at apex; inner margin broadly fuscous.

Expanse, ♂ 52, ♀ 61 mm.

Hab. Tuis, Juan Vinas.

Closely allied to *H. atrax*, Schs.

Heterocampa livida, sp. n.

♂. Head and thorax olive-brown. Tegulæ and patagia steel-blue, edged with green. Abdomen fuscous grey; base and terminal segment buff. Fore wings green; steel-blue spots on basal half of costa and one on inner margin antemedially; some darker green at base below cell; antemedial line indistinct, geminate; an oblique dark green shade from cell to middle of inner margin, followed by a bluish-grey shade in and below cell; a paler green space at end of cell extending on to costa, containing a small brown spot at end of cell, and followed above vein 4 by a dark greenish shade to subterminal, this shade being crossed by the fine lunular, geminate, postmedial line; the subterminal broad, steel-blue, edged with fuscous, inset below vein 3; a pale green space at apex; a submarginal fuscous lunular shade from veins 3–7; a terminal fuscous shade from vein 3 to apex, irrorated with white on veins; cilia spotted with brown. Hind wings fuscous; the base whitish buff; a black postmedial line, followed by a pale shade.

Expanse 41 mm.

♀. Head and thorax steel-blue, the collar edged with fuscous. Fore wings steel-blue, the lines lunular, black, geminate; the basal line filled in with green in and below cell; the antemedial shaded with green towards inner margin; a curved black line at end of cell, followed by a brown-tinged space, extending below cell to antemedial; the postmedial shaded with brown from veins 3–7; the subterminal single, lunular, heavily marked, black, shaded with white and olive-brown outwardly; terminal black streaks on veins, expanding into spots on cilia. Hind wings fuscous brown, darkest on outer margin; a paler postmedial shade; cilia terminally whitish and with fuscous spots.

Expanse 51 mm.

Hab. Juan Vinas, Tuis.

Heterocampa lucoides, sp. n.

♂. Head, collar, and thorax olive-green, with darker patches on patagia. Abdomen above fuscous grey. Fore wings yellowish green, mottled with olive-green, forming a

dark patch around end of cell; a subbasal line; a basal spot on costa and below cell; an antemedial spot on costa, followed from subcostal to inner margin by a deeply lunular geminate line, outwardly heavily shaded with dark green between cell and submedian fold; a pale line on discocellular outwardly darkly shaded; the postmedial geminate, lunular from vein 6 to inner margin, followed by a dark shade between veins 2 and 3; subterminal dark green lunular shades, heaviest between veins 3–6; a submarginal olive-green shade; terminal dark spots between the veins; dark green spots on cilia at end of veins. Hind wings somewhat smoky, tinged with roseate buff; a paler postmedial shade.

Expanse 40 mm.

Hab. Juan Vinas.

Allied to *Heterocampa* (*Luca*) *herbida*, Wlk.

Heterocampa meretricia, sp. n.

Palpi black behind, greenish buff in front. Frons light brown. Vertex, collar, and thorax olive-green. Abdomen green above, paler on two terminal segments; underneath luteous. Fore wings light green; the base to antemedial, which is nearly straight, dark olive-green; a faint irregular medial line; a large buff spot at end of cell, containing two brown spots on discocellular; a postmedial fuscous line, lunular and faintly geminate, starting from a fuscous shade on costa; subterminal black spots, inset between veins 4 and 6; quadrate black spots on cilia at ends of veins. Hind wings roseate; the outer margin broadly fuscous, preceded by a fuscous postmedial line; cilia pale green spotted with black.

Expanse 40 mm.

Hab. Tuis.

Heterocampa novella, sp. n.

Head, collar, and thorax brown tinged with violaceous, the vertex mottled with dull green. Abdomen brown tinged with grey. Fore wings brown; the costal margin from base to postmedial mottled with dull green; the inner and outer margins dull green; the lines indistinct, consisting of vague fuscous shades; the antemedial geminate on costa; the discocellular lighter brown with a fuscous shade beyond and below it; a small whitish postmedial spot on costa; a broad subterminal fuscous shade from vein 3 to near apex, preceded by a faint pale brown shade; a fine black interrupted marginal line; cilia roseate brown with fuscous spots at veins.

Hind wings thinly scaled, the inner and outer margins more distinctly fuscous brown; a dark postmedial line followed by a paler shade; cilia roseate brown tipped with white.

Expanse 39 mm.

Hab. Sixola, Avangarez.

Allied to *H. sylla*, Druce.

Heterocampa peralta, sp. n.

♂. Head and collar violaceous brown. Patagia pale green with a white spot on dorsal edge; pale green tufts on thorax behind with long spatulate scales. Abdomen rich brown. Fore wings dull fuscous brown; a green basal line; antemedial and medial green spots on costa; an oblique fuscous shade across end of cell to near tornus; area beyond cell and above vein 3 lighter brown; outer half of inner margin white, coalescing with two small white spots on submedian, and marked by a greenish spot between them; outer margin shaded with fuscous to near apex; a terminal whitish-grey line; cilia light brown spotted with fuscous at veins. Hind wings dark brown; traces of a pale postmedial line; cilia whitish streaked with brown at veins.

Expanse 33 mm.

Hab. Peralta.

Heterocampa perplexa, sp. n.

♂. Head and thorax mottled green and brown; the tegulæ dark violaceous brown. Abdomen brown dorsally, becoming paler terminally; laterally fuscous. Fore wings: the base narrowly green, crossed and limited by a dark brown line; a black point below cell; antemedial space dark violaceous brown, limited by the geminate dark antemedial line which forms three outward curves below subcostal; medial space dark reddish brown from subcostal to submedian fold, below which it is green, and there are some green spots on costa; a light brown shade on discocellular closely followed by a black medial line; beyond medial the wing is green; the postmedial lunular, geminate, black, partly indistinct; subterminal brownish spots between veins 4–7, crossed by a pale line; an inwardly lunular marginal black line; the veins terminally streaked with black. Hind wings white; the inner margin and a terminal line fuscous; the veins terminally fuscous; a buff spot at anal angle. Two specimens from Sixola have a dark grey streak from

medial to subterminal between veins 4 and 5, and the reddish-brown medial shade extends between veins 2 and 3 to near tornus; the veins on hind wings are black except at base.

Expanse 39 mm.

♀. Head, collar, and thorax moss-green. Fore wings paler in tint; three dark spots on subterminal shade between 4 and 7, and three spots between vein 3 and inner margin, the spot between 2 and 3 largest. Hind wings fuscous grey; a buff spot at anal angle; the cilia light brown and white with dark spots at veins.

Expanse 43 mm.

Hab. Juan Vinas, Sixola, Avangarez.

Heterocampa plebeia, sp. n.

Palpi dark brown fringed with buff-brown. Thorax dark brown; head, collar, and patagia light brown. Abdomen fuscous brown. Fore wings brown, the lines darker; the basal geminate; the antemedial geminate, finely dentate on costa and in cell, wavy below cell, dentate on submedian; antemedial space dark brown from costa across cell; a whitish-buff space below cell and on base of inner margin; a dark brown spot at end of cell, followed by a dull shade oblique from costa, angled at vein 4; the postmedial indistinct, geminate, followed by greyish scales on submedian and veins 2–4, and by dark brown shades on costa, and from vein 2 to inner margin, also by a quadrate dark brown shade between veins 4 and 5; a subterminal whitish-buff line, obsolescent towards apex; the veins beyond postmedial streaked with black; a faint terminal buff line above tornus. Hind wings brown; an indistinct postmedial buff shade; cilia whitish buff.

Expanse 38 mm.

Hab. Juan Vinas, El Sitio, Tuis.

Heterocampa princeps, sp. n.

♀. Head, thorax, and fore wings pale yellowish green. Abdomen light buff; some reddish brown at base dorsally; two transverse patches on last segment dorsally. Fore wings: a dark oblique shade from base of cell to inner margin suffusing above submedian with a fine curved antemedial line; an oblique darker green shade medially from costa to vein 2 subterminally, on which is a still darker lunate spot on discocellular; postmedial greenish-white spots on veins preceded and followed by small dark spots most noticeable on veins 2–4; dark streaks close to cell on

veins 3 and 4; an indistinct subterminal shade with darker shadings on veins; dark green points on cilia at veins. Hind wings white faintly tinged with yellow, more distinctly on inner margin.

Expanse 45 mm.

Hab. Juan Vinas, El Sitio.

Heterocampa proba, sp. n.

♂. Head and thorax dark moss-green; some white scales on tegulæ behind. Abdomen above brown, paler dorsally; anal hairs tinged with rufous. Fore wings dark moss-green; a curved geminate dark brown basal line, filled in with lighter brown; the antemedial, geminate, finely wavy, lunular; an indistinct brownish mark on discocellular; the postmedial lunular between veins, faintly geminate, with white points on veins and a white line on inner margin; subterminal brown and fuscous spots between the veins, inset between 4 and 6; the veins on terminal third of wing tinged with fuscous and irrorated with grey scales; white points terminally on veins. Hind wings brown; the cell and beyond more thinly scaled showing a whitish ground; the costal margin dark moss-green, with a geminate postmedial line, continuing as a pale shade to inner margin.

Expanse 40 mm.

♀. The abdomen with dark brown dorsal tufts. Fore wings brighter green; the subterminal spots sagittate. Hind wings greyer, the outer margin tinged with green.

Expanse 49 mm.

Hab. Juan Vinas.

Allied to *H. delira*, Schs.

Heterocampa spectra, sp. n.

♀. Head, collar, and thorax white mottled with brownish grey hairs. Abdomen ochreous buff, the terminal segment dorsally whitish. Fore wings white, thinly irrorated with ochreous brown and dark brown; a wavy, curved, basal ochreous-brown line; the antemedial faint, geminate, fuscous, oblique from cell, terminating in a fuscous patch on middle of inner margin; a small dark brown spot at end of cell, and two oblique brown lines above it on costa; postmedial geminate, lunular, fuscous, indistinct, followed by a brownish shade on costa; subterminal sagittate black spots between the veins; cilia white spotted with brown at veins. Hind wings light greyish brown; a dark terminal line; a postmedial whitish shade.

Expanse 47 mm.
Hab. Poas.
Allied to *H. isidra*, Schs.

Rhuda tuisa, sp. n.

Palpi and frons mottled grey and brown, the latter crossed by a brown line. Vertex, collar, and thorax olive-brown; whitish lines on collar in front; patagia crossed by a white transverse line, and posteriorly with a large lilacine-grey patch. Abdomen brownish above, ochreous tufts laterally: underneath yellowish. Fore wings: a silvery-white stripe from base of cell to submedian at inner line, below which the basal area is white irrorated with fuscous brown; a brown shade from base of costa to tornus and along inner margin beyond the inner line, with a fuscous streak at base of subcostal and median, and submedian medially; above the brown shade the wing is roseate across cell and between veins 2 and 4 to near termen, and is crossed by three fine outer lines, very oblique inwardly from vein 4, the outer of the three lines much thickened between 2 and 3; above the roseate shade a narrow silvery-white shade surrounding an elongated silky olive-brown space along costa which is posteriorly edged by a fuscous-brown line, oblique from costa to lower angle of cell, straight along vein 4 to within 4 mm. of termen and then finely crenulate to costa; a wavy marginal brown line, beyond which the termen is thickly irrorated with brown. Hind wings yellow; the apex and outer margin broadly black.
Expanse, ♂ 50 mm.
Expanse, ♀ 59 mm.
Hab. Sixola, Tuis.

Chadisra hibrida, sp. n.

♂. Palpi, head, collar, and thorax light brown shaded with reddish brown; a black spot on vertex behind; patagia grey mottled with brown. Abdomen above fuscous brown; greyish tuft at base, and grey dorsal line expanding terminally. Fore wings grey: an interrupted basal black line beyond which to antemedial the space is tinged with fuscous brown; the antemedial geminate, the first line indistinct fuscous, the second line velvety fuscous brown, sinuous, the narrow shade between them lighter brown; an inbent whitish line on discocellular followed by a vague medial fuscous shade; the postmedial velvety fuscous brown, slightly incurved from subcostal to vein 4 then wavy and somewhat

oblique to inner margin, followed by a brownish shade limited by the subterminal, which consists of coalescing clusters of velvety scales between 5 and 8, followed by a whitish line somewhat outcurved on vein 4, and parallel with termen to inner margin ; the outer margin whitish irrorated with brown, very densely so above vein 4; some marginal dark brown lunules between 4 and 7 ; terminal dark spots at veins extending on cilia. Hind wings white, the vein on outer half dark brown ; the outer margin fuscous brown ; cilia white.

Expanse 38 mm.

♀. Collar fuscous brown. Fore wings very similar to male, the subterminal velvety black continuous, almost straight from costa to below vein 4, where it is angled outwardly, then inbent, and finely dentate, outwardly edged with white ; a fine marginal brown line, angled below vein 4. Hind wings fuscous, tinged with white at base ; cilia brownish tipped with white.

Expanse 38 mm.

Hab. Tuis.

Chadisra luculenta, sp. n.

Palpi dark brown, greyish in front. Frons dark grey. Vertex, collar, and thorax buff shaded with brown ; patagia grey irrorated with fuscous, and dorsally edged with brown. Abdomen dorsally and terminally grey, laterally broadly fuscous brown ; underneath white. Fore wings light brown irrorated with fuscous below cell on basal third ; the costal margin crossed by black lines medially, spotted with black and white on apical third ; an antemedial geminate black line filled in with white from subcostal to submedian, followed by a broad white space crossed by dentate black lines, limited by a geminate lunular black line inset on vein 3, so the white space becomes much narrower and terminates in a point on inner margin ; the apex shaded with white ; subterminal triangular black spots between veins 5 and 8, and small dark brown intervenal spots below vein 4 ; an irregular marginal black line ; an interrupted dark brown line at base of cilia, which is white with geminate brownish streaks. Hind wings white ; the outer margin black, widest at apex ; some fuscous hairs on inner margin above angle.

Expanse, ♂ 37 mm.

Expanse, ♀ 41 mm.

Hab. Juan Vinas, Tuis.

Chadisra prælauta, sp. n.

♀. Palpi in front white irrorated with brown, dark brown behind. Head, collar, and thorax brown; patagia grey. Abdomen brown above, the basal segment whitish grey. Fore wings: basal third of costal margin and cell whitish irrorated with brown; below cell more narrowly similar, limited by an inwardly oblique fuscous shade from cell, and with a brown streak below median; a wavy black medial line divided in cell by a light brown shade and followed by a dark grey shade at end of cell; the medial space brown; a postmedial lunular black line inset on vein 3, irregularly edged with white and followed by a brown space, leaving the terminal area above vein 3 white thinly irrorated with brown; subterminal black spots between veins 6 and 8, and smaller spots between 2 and 4; a marginal irregular brown line, beyond which the irrorations are thicker. Hind wings: basal half whitish irrorated with brown; outer half fuscous, narrowing at anal angle; cilia white.

Expanse 35 mm.

Hab. Tuis.

Rifargia dissepta, sp. n.

♂. Head brownish mottled with grey. Tegulæ brown, tipped with grey behind, and with two lines of grey scales in front. Thorax and abdomen grey irrorated with brown except on four basal segments of abdomen. Fore wings and cilia whitish thickly irrorated with light brown; a brownish basal shade on costa, preceded by an oblique white spot and some darker brown scales in and below cell; two fine black lines on either side of discocellular, the inner one angled anteriorly, the branch extending towards base, the outer one angled at middle of discocellular, the branches extending outwardly; a fine brownish medial shade and fine postmedial lunular line around end of cell; a subterminal whitish dentate shade with fuscous streaks between veins 4–8 and a small fuscous spot above and below vein 2; a marginal dark line straight from costa to vein 4, then lunular. Hind wings white at base, the veins and some hairs brownish; the outer margin broadly black; cilia white.

Expanse 45 mm.

♀. Fore wings: no basal dark markings; traces of an antemedial lunular line; no black lines at discocellular, the medial area from cell to inner margin tinged with fuscous brown, and a similar shade at end of cell.

Expanse 47 mm.

Hab. Avangarez.

Possibly only an extreme form of *R. distinguenda*, Wlk.

Lobeza irrorata, sp. n.

♂. Head, collar, and thorax whitish grey mottled with dark brown hairs; on thorax posteriorly a curved dark brown line, the scales partly tipped with ochreous. Abdomen: dorsally fuscous brown, with light brown shades anteriorly on segments; a small white tuft at base and a white dorsal line; last segment grey. Body below white. Fore wings white thinly irrorated with dark brown and ochreous, the latter chiefly along the lines and on antemedial portion of inner margin; an indistinct geminate antemedial line, deeply dentate and suffusing with medial shade above submedian; the medial crossing end of cell, nearly straight and outwardly toothed on veins, followed by a broad whitish space; the postmedial, geminate, lunular, more wavy in the female, and thickly irrorated with dark brown and ochreous; the termen clearer white; an irregular brown marginal line. Hind wings white; some fuscous scales at base; a medial fuscous line not reaching costa.

Expanse 69 mm.

♀. Fore wings more evenly and thickly irrorated with brown scales.

Expanse 90 mm.

Hab. Juan Vinas, Tuis, Sixola.

Allied to *L. schausi*, Dogn.

Anita costalis, sp. n.

Palpi whitish buff in front, dark brown behind. Head, collar, and thorax dark brown; a streak in front of antennæ and patagia whitish buff. Abdomen above fuscous brown. Fore wings: the cell anteriorly and costal margin whitish buff; the extreme costa finely black-brown, somewhat broader towards apex; the wing otherwise olive-brown, paler between veins 4 and 6; veins 5 and 6 and 7 terminally dark brown; a transverse fuscous-brown shade at base; traces of a darker geminate antemedial line below cell; a curved dark shade on discocellular, edged with whitish buff; traces of a postmedial line from below vein 5, outwardly shaded with whitish buff between 5 and 4. Hind wings irrorated with fuscous brown.

Expanse 42 mm.

Hab. Sixola.

Allied to *A. basipuncta*, Schaus.

Hemiceras amanda, sp. n.

♂. Head and thorax lilacine brown; some white irrorations on vertex. Abdomen brown above, buff underneath.

Fore wings brown tinged with lilacine; the lines consisting of white points on veins; a white point at base below median; the antemedial nearly straight; the outer line from costa at 2 mm. from apex to middle of inner margin; an oblique fuscous spot at end of cell, from which an oblique slightly darker brown shade extends to outer margin; faint subterminal dark streaks on veins 6–8; a few whitish scales at apex; cilia brown; the inner margin lobed and excised. Hind wings brown, the veins darker; cilia tipped with white; no opaque spot.

Expanse 38 mm.

Hab. Juan Vinas.

Allied to *H. muscosa*, Schs.

Hemiceras ceiba, sp. n.

♂. Head and collar fawn-colour, the vertex white. Thorax lilacine brown. Abdomen light brown above tinged with fuscous. Body underneath buff-brown. Fore wings bright reddish brown tinged with lilacine; a fine grey streak along costa; three antemedial black points, the one on median more remote from base; apex fuscous with white irrorations; a fine straight dark brown line from apex to middle of inner margin, faintly punctiform on veins, and outwardly edged by a lighter brown line; inner margin lobed and excised. Hind wings whitish tinged with brown; the veins, inner and outer margins light brown; the stigma darker brown.

Expanse 48 mm.

Hab. Tuis.

Hemiceras celia, sp. n.

♂. Head and collar reddish brown; vertex and base of antennæ white; collar posteriorly, patagia, and abdomen dorsally violaceous brown. Body below brownish buff. Fore wings silky reddish brown tinged with violaceous except on outer margin which is dull reddish brown, branching to postmedial between veins 3 and 4; extreme costa irrorated with fuscous and white, but very indistinct; antemedial fine, nearly straight, dull reddish brown, indistinctly punctiform on veins; a fine black streak on discocellular; postmedial similar, linear from vein 2 to inner margin, consisting of black points on veins from 2 to costa; inner margin lobed and excised. Hind wings silky brown without a stigma; cilia tipped with white.

Expanse 45 mm.

Hab. Tuis.

Hemiceras clarki, sp. n.

♂. Head, collar, thorax, and fore wings brownish buff faintly tinged with roseate; collar edged posteriorly with fuscous grey. Abdomen above fuscous brown. Body below whitish. Fore wings: lines fine, yellowish buff, edged on medial side with olive-brown; the antemedial slightly outcurved; the postmedial from costa at 2 mm. from apex to middle of inner margin; the inner margin straight; a large black spot at end of cell, preceded by another spot below subcostal; veins finely irrorated with greyish; a faint darker subterminal shade inset at vein 4. Hind wings light silky brown; the opaque spot concolorous.

Expanse 46 mm.

The female has the discal spots faintly indicated.

Hab. Juan Vinas, Alajuela.

Named after Mr. J. B. Clark of Alajuela, at whose house I first discovered this species.

Hemiceras corema, sp. n.

♂. Head, collar, and thorax lilacine brown; a white line across top of frons. Abdomen slightly darker above. Body below whitish. Fore wings lilacine brown; the costa finely whitish; the lines light buff, shaded with darker brown on medial side; the antemedial straight; the postmedial oblique from costa at 3 mm. from apex to inner margin just beyond middle; a black spot on discocellular preceded by a black spot close to subcostal; the veins partly irrorated with grey and fuscous; faint traces of a pale subterminal shade; cilia dark brown, finely tipped with white; inner margin sinuous. Hind wings whitish shaded with brown, darkest on outer margin; an opaque brown spot at vein 2; cilia brown basally, outer half white.

Expanse 42 mm.

Hab. Sixola, Avangarez.

Allied to *H. pulverula*, Gn., and *H. indigna*, Schs.

Hemiceras lepida, sp. n.

♂. Head, collar, and thorax lilacine brown; a white band across top of frons. Abdomen greyish brown above, whitish underneath. Fore wings light lilacine brown irrorated with pale reddish brown; antemedial line from subcostal, fine, wavy, indistinct, brown, followed by a darker brown shade outwardly curved to inner margin near tornus; a faint oblique fuscous streak at end of cell, from which a brown shade extends to outer margin, where it expands towards apex and

tornus; an outer row of black points on veins from costa at 3 mm. from apex to vein 2; an indistinct subterminal dentate brown shade; cilia brown. Hind wings whitish; the veins and margins tinged with brown; a large opaque brown spot at vein 2; cilia tipped with white. Inner margin of fore wings slightly lobed and excised.

Expanse 45 mm.

Hab. Juan Vinas, Tuis, Limon.

Hemiceras rava, sp. n.

♂. Head, collar, and thorax lilacine brown. Abdomen above greyish brown. Body below pale buff. Fore wings brown; the antemedial fine, black, nearly straight, with a black point on median and submedian; an oblique darker brown spot at end of cell; postmedial consisting of black points on veins partly irrorated with grey scales, inwardly oblique from costa at 2 mm. from apex to middle of inner margin and followed by a dark shade below vein 2; a deeply dentate subterminal darker brown shade from costa to vein 2; inner margin nearly straight. Hind wings light brown; the veins and outer margin darker brown; a whitish shade at base due to thin scaling.

Expanse 37 mm.

Hab. Sixola, Guapiles, Tuis, Juan Vinas.

Very closely allied to *H. lotula*, Gn., and *H. tulola*, Schs.

Hemiceras siderea, sp. n.

♀. Palpi and frons ochreous buff. Vertex fuscous brown and white. Collar dark reddish brown and white. Thorax fuscous brown irrorated with white; patagia ochreous brown. Abdomen above fuscous grey. Body below and anal hairs yellowish. Fore wings reddish brown tinged with grey, except on costal and outer margins; the extreme costa white; two oblique black points at end of cell; antemedial outlined by whitish irrorations on either side below cell to inner margin, and a white point on subcostal; postmedial similarly formed, being preceded by white points on veins which are irrorated with black and white from cell, and followed by broad whitish streaks irrorated with reddish brown along veins to near termen, these streaks being also spotted with fuscous brown subterminally; outer margin otherwise broadly deep yellow; inner margin slightly lobed and excised. Hind wings fuscous brown; cilia yellowish white.

Expanse 45 mm.

Hab. Guapiles, El Sitio.

Hemiceras torva, sp. n.

Palpi buff in front, brown behind. Head: frons lilacine brown; a white band behind; vertex white irrorated with brown. Collar buff shaded with brown and violaceous behind. Thorax violaceous; patagia ochreous buff. Abdomen light brown above. Body yellowish white underneath. Fore wings ochreous buff; a fine wavy antemedial line, faintly punctiform on veins; a small brownish spot at end of cell, preceded by a point below subcostal; a row of fuscous points on veins from costa at 2 mm. from apex to a large spot on inner margin at excision, this spot somewhat reniform, brown broadly edged with dark violaceous; the lobe and excision on inner margin finely edged with dark violaceous; a subterminal dentate palo brownish shade from vein 4 to apex. Hind wings brownish white; the veins terminally, inner and outer margins more distinctly brown; the stigma still darker.

Expanse 41 mm.

Hab. Sixola, Guapiles.

Close to *H. valkeri*, Schs.

Hemiceras zula, sp. n.

Head: frons reddish brown; vertex grey mottled with white. Collar and thorax greyish, irrorated with reddish brown. Abdomen above fuscous grey. Body below whitish. Fore wings silky grey, palest on costal margin; antemedial line fine, dark brown, outwardly oblique across cell, indentato below cell, then outwardly oblique but slightly indentate on submedian, with black points at subcostal and at angles; postmedial very fine, brown, lunular, dentate with black points on veins; a faint silky brown shade from vein 2 to inner margin crossed by postmedial; some faint silky brown shades on outer margin; inner margin lobed and excised. Hind wings greyish brown; a whitish shade in and beyond cell; cilia white, opaque spot concolorous.

Expanse 42 mm.

The female has pectinated antennæ.

Expanse 46 mm.

Hab. Tuis.

Distinguished from *H. deornata*, Wlk., by the pectinated antennæ in the female and the more angular antemedial line.

XXXI.—*Descriptions of some new Species of Heterocera from Tropical South America, and Two new Species of* Geometridæ *from West Africa.* By Herbert Druce, F.L.S. &c.

Fam. **Syntomidæ.**

Homœocera sandion, sp. n.

Male.—Head and antennæ black, collar and tegulæ dark orange-yellow; thorax and abdomen greenish black, banded with orange-yellow at the base and on the sides of the abdomen; legs orange-yellow, banded with black. Primaries hyaline, the veins and margins black: secondaries hyaline, the veins and inner margin black.

Expanse $1\frac{1}{4}$ inch.

Hab. Colombia, Pueblo Rico, San Juan; Choco, 5200 feet (*Mus. Druce*).

Homœocera duronia, sp. n.

Male.—Head, palpi, thorax, and abdomen black; antennæ black, tipped with white, the base of the thorax and the last four segments of the abdomen banded with red; the underside of the abdomen metallic green; the legs pure white. Primaries hyaline, the base, costal margin, a spot at the end of the cell, and a mark below the apex on the outer margin all black; the veins dark: secondaries hyaline, the inner margin broadly black.

Expanse $1\frac{1}{2}$ inch.

Hab. Colombia, 2700 m. (*Mus. Druce*).

Allied to *Homœocera rodriguezi*, Druce.

Macrocneme semiviridis, sp. n.

Male.—Head, palpi, antennæ, collar, tegulæ, and thorax black, antennæ tipped with white; abdomen and legs bluish black, the sides of the abdomen spotted with white at the base; the underside of the abdomen with a central row of white spots extending from the base to the anus. Primaries black, the basal half metallic blue-green, the veins and fringe black: secondaries metallic blue-green, the apex and outer margin black, the fringe black. Underside very similar to the upperside.

Expanse $1\frac{3}{4}$ inch.

Hab. Colombia, Siato, Rio Siato; slopes of Choco, 5200 feet (*Mus. Druce*).

Fam. **Hypsidæ.**

Eucyane meres, sp. n.

Male.—Head, antennæ, collar, tegulæ, and thorax black; abdomen and legs black, glossed with dark blue. Primaries black, crossed from the costal margin beyond the cell almost to the anal angle by a narrow crimson line, which is widest on the costal margin; the fringe black: secondaries glossy dark blue, almost black in some lights; the fringe black. The underside similar to the upperside, but the crimson band wider.

Expanse $2\frac{1}{4}$ inches.

Hab. Colombia, Siato, Rio Siato; slopes of Choco, 5200 feet (*Mus. Druce*).

Pericopis practides, sp. n.

Male.—Head, antennæ, palpi, collar, tegulæ, thorax, abdomen, and legs black, the tegulæ tipped with yellow, the sides of the abdomen spotted with white, the underside of the abdomen with a double row of yellow spots; the anal tuft red. Primaries blackish brown, shaded with semihyaline grey at the end of the cell and beyond the cell to the inner margin; the inner margin edged with chrome-yellow, extending from the base to the anal angle; a marginal row of small white dots extends from the apex to the anal angle; a red spot at the base of the wing: secondaries semihyaline white, clouded with blackish brown, the veins black; the costal and outer margin broadly bordered with chrome-yellow, edged with black on both sides; a series of white points extends from the apex to the anal angle. Underside very similar to the upperside, except that the outer margin of the primaries is broadly bordered with chrome-yellow almost to the apex.—*Female* very similar to the male, but browner and the marking more indistinct; the submarginal greyish-white line much more distinct; the abdomen banded with white.

Expanse, ♂ $2\frac{1}{2}$, ♀ 3 inches.

Hab. Colombia, Paso del Quindin, 3600 m. (*Mus. Druce*).

Allied to *Pericopis arema*, Boisd., and *Pericopis palmeri*, Druce.

Hyalurga grandis, sp. n.

Male.—Head and collar black, spotted with white; antennæ and legs black; tegulæ chrome-yellow, edged with black; thorax black, with two large white spots at the base;

abdomen above chrome-yellow, with a wide central black line extending from the base to the anus; a greyish-black line on each side of the abdomen, the underside pure white. Primaries semihyaline white, the costal margin, apex, outer and inner margin broadly bordered with chrome-yellow, edged with black on both sides, the veins and a spot at the end of the cell all black: secondaries hyaline white, broadly bordered with chrome-yellow from the apex to the anal angle; the veins all black. The underside of both wings very similar to the upperside, but with the outer margins much blacker.

Expanse $2\frac{1}{2}$ inches.

Hab. Peru, Chanchamayo (*Mus. Druce*).

This species is allied to *Hyalurga noquei*, Dogn.; it differs from all the other species of *Hyalurga* known to me by having all the veins of both wings black.

Hyalurga whiteleyi, sp. n.

Male.—Head, antennæ, and collar black, the head spotted with white; tegulæ yellow; thorax black, with two white spots at the base; abdomen tawn-colour above, the sides and underside white; a brownish-black line on each side extending from the base to the anus; legs black and white. Primaries whitish hyaline, the costal margin from the base to about the middle dark yellow, then grey nearly to the apex; the apex and outer margin to the anal angle edged with yellow, bordered with black on the inner side, the marginal line white; the fringe black; a narrow black line crosses the wing near the apex to the outer margin above the anal angle, the veins dusky: secondaries hyaline white, bordered with yellow from the apex to the anal angle, and edged with black on the inner side; the marginal line white; the fringe black. The underside very similar to the upperside, but without any of the yellow borders.

Expanse 2 inches.

Hab. Peru, Rio Napo (*Whiteley*); Ecuador, Sarayacu (*Buckley*, *Mus. Druce*).

Fam. **Lithosidæ.**

Josiomorphia albolineata, sp. n.

Male.—Head, palpi, antennæ, collar, tegulæ, and thorax black; abdomen glossy dark bluish black; legs black. Primaries black, with a wide white central band extending from the base and crossing the lower half of the cell almost to the outer margin; the fringe black: secondaries white, bordered

with black from the base to the apex and from the apex to the anal angle; the inner margin white; the fringe black. Underside as above.

Expanse $1\frac{3}{4}$ inch.

Hab. Colombia, Pueblo Rico, La Selva, San Juan; Choco, 2500 feet (*Mus. Druce*).

Josiomorphia andosa, sp. n.

Male.—Head, palpi, antennæ, collar, tegulæ, thorax, abdomen, and legs black; abdomen with a white line on each side extending from the base to the anus; the underside of the abdomen white. Primaries black; a pale yellow central band extends from the base to nearly the outer margin; the band is wide to the end of the cell and then becomes narrow: secondaries pale yellow, bordered with black on the costal and outer margins; the fringe black. Underside as above.

Expanse 2 inches.

Hab. Colombia, Siato, Rio Siato; Chaco, 5000 feet (*Mus. Druce*).

Allied to *Josiomorphia patula*, Walk., and *Josiomorphia striata*, Druce.

Fam. **Cossidæ.**

Brachylia inconspicua, sp. n.

Male.—Head, antennæ, collar, and thorax reddish brown; tegulæ reddish brown, with a white spot at the base; abdomen pale brown, clothed with greyish hairs. Primaries pale brown, striated with dark reddish-brown lines; three bands of reddish-brown spots edged with white cross the wing from the costal to the inner margin nearest the base; the fringe pale brown: secondaries blackish brown, mottled with grey spots. The underside of both wings very similar to the upperside, but paler in colour.

Expanse $1\frac{1}{2}$ inch.

Hab. W. Colombia, San Antonio, 5800 feet (*Mus. Druce*).

Brachylia dentilinea, sp. n.

Male.—Head, collar, tegulæ, thorax, and abdomen above pinkish brown; the underside of the abdomen and legs greyish; antennæ black. Primaries pale pinkish brown, darkest from the end of the cell to the apex and outer margin; a series of fine dentated dark brown lines cross the wing from the costal to the inner margin; the fringe dark brown: secondaries pale brown, striated with fine dark brown lines.

Underside of both wings very similar to the upperside.—The *female* like the male, but slightly larger.

Expanse, ♂ $1\frac{1}{2}$, ♀ $1\frac{3}{4}$ inch.

Hab. Colombia, Tado, Rio San Juan; Choco, 250 feet (*Mus. Druce*).

Langsdorphia pallida, sp. n.

Male.—Head, antennæ, collar, tegulæ, thorax, abdomen, and legs pale greyish brown. Primaries pale brown, the costal margin spotted with dark brown; a row of pear-shaped dark brown spots edged with white extends from the apex to the middle of the inner margin; a square-shaped brown spot edged with white close to the base; several indistinct white lines extend from the base partly across the wing; the fringe dark brown: secondaries greyish white, with a submarginal row of indistinct pale brown spots from the apex to the anal angle; the fringe dark brown.

Expanse $1\frac{1}{2}$ inch.

Hab. Chili (*Mus. Druce*).

Zeuzera ityx, sp. n.

Male.—Head, collar, tegulæ, thorax, and abdomen sordid white; antennæ yellowish brown; legs greyish brown. Primaries white, thickly striated with fine brown lines; a black band close to the base and a black spot on the costal margin beyond the cell: secondaries white, the veins pale yellowish brown. Underside of both wings very similar to the upperside.

Expanse $1\frac{3}{4}$ inch.

Hab. Colombia, Jimenez; Rio Dagua, 1600 feet (*Mus. Druce*).

Zeuzera roxana, sp. n.

Male.—Head, collar, tegulæ, thorax, legs, and abdomen dark grey; antennæ yellowish brown. Primaries grey, thickly irrorated with dark brown scales; a short black band on the inner margin near the base; the fringe dark grey: secondaries dark grey, irrorated with black scales.

Expanse $1\frac{1}{2}$ inch.

Hab. Colombia, Tado, Rio San Juan; Choco, 250 feet (*Mus. Druce*).

Zeuzera undulosa, sp. n.

Male.—Head, collar, tegulæ, thorax, abdomen, and legs greyish white; antennæ pale brown. Primaries white,

thickly marked with indistinct brown spots and small lines: secondaries greyish white. Underside similar to the upperside.

Expanse $1\frac{1}{4}$ inch.

Hab. Colombia, Tado; Rio San Juan, 250 feet (*Mus. Druce*).

Fam. **Notodontidæ.**

Rosema falcata, sp. n.

Male.—Head, thorax, and tegulæ green; antennæ and collar black; base of thorax blackish brown; abdomen pinkish cream-colour; legs brown. Primaries green, the apex very slightly edged with brown: secondaries dark pinkish cream-colour. Underside of both wings pinkish brown, the primaries green on the inner margin.

Expanse $1\frac{3}{4}$ inch.

Hab. Colombia, Siato, Rio Siato; slopes of Chaco, 5200 feet (*Mus. Druce*).

Fam. **Ægeridæ.**

Ægeria ventralis, sp. n.

Male.—Head, antennæ, palpi, tegulæ, thorax, abdomen, and legs black; collar and anal tuft bright red, with some long black hairs beyond. Primaries and secondaries hyaline, the costal and outer margins of both wings black; the veins black.

Expanse 1 inch.

Hab. East Peru, Chanchamayo, 2000 m. (*Mus. Druce*).

Ægeria peruviana, sp. n.

Male.—Head, palpi, antennæ, collar, tegulæ, and thorax black; abdomen black, the two basal segments dark brown; legs pale yellowish brown. Primaries and secondaries pale yellowish hyaline, the veins all dark brown; the fringe of both wings brown.

Expanse 1 inch.

Hab. Peru, Chanchamayo, La Mercede, 1000 m. (*Mus. Druce*).

Fam. **Geometridæ.**

Agathia minuta, sp. n.

Male.—Head, collar, tegulæ, thorax, and abdomen pale green; antennæ brown; palpi green above, white on the underside; legs and underside of the abdomen whitish

brown. Primaries pea-green, the costal margin, a waved line crossing the wing at the end of the cell, and a band crossing the wing beyond pale brown; the marginal line brown; the fringe white: secondaries green, the anal angle and part of the outer margin pale greyish brown; the brown lines similar to those on the primaries. Underside of both wings uniformly pale whitish green, both wings with a rather wide submarginal black band.

Expanse 1 inch.

Hab. West Africa, Bitje, Ja River, Cameroons, 2000 feet, dry season (*Mus. Druce*).

Agatha (?) *semirufa*, sp. n.

Female.—Front of head and palpi black; head, collar, tegulæ, and thorax yellowish green; abdomen pale brown; legs black. Primaries yellowish green, broadly bordered from the middle of the outer margin to the anal angle with dark blackish brown: secondaries orange-red, broadly bordered from the apex to the anal angle with blackish brown, irrorated with orange-red scales; the fringes of both wings black. Underside of both wings red, with blackish-brown borders.

Expanse $1\frac{1}{4}$ inch.

Hab. West Africa, Bitje, Ja River, Cameroons, 2000 feet, dry season (*Mus. Druce*).

Oospila dolens, sp. n.

Male.—Head, collar, tegulæ, and thorax dull green; antennæ black; abdomen black above, greenish on the underside; legs brown. Primaries black, the base, a spot at the apex, and a small spot about the middle of the outer margin dull green; the fringe black: secondaries dull green, broadly bordered from the apex to the anal angle with black; a black dot at the end of the cell; the fringe black and dull white. Underside very similar to the upperside.

Expanse $1\frac{1}{10}$ inch.

Hab. West Colombia, La Maria, Dagua Valley, 4700 feet (*Mus. Druce*).

Racheospila ockendeni, sp. n.

Male.—Head, palpi, antennæ, collar, thorax, and abdomen reddish brown; tegulæ white, edged with green on the upper side; legs greenish white. Primaries dull green, banded and irrorated with white; a wide submarginal brown band extends from near the apex to the anal angle, where it is

irrorated with black and white scales: secondaries similar to the primaries, with a large brown spot at the anal angle; the marginal line black; the fringe white. Underside greenish white: primaries with a wide submarginal black band extending from near the apex to the anal angle: secondaries with a large black spot at the anal angle.

Expanse $1\frac{3}{4}$ inch.

Hab. Peru, La Union, Rio Huacamaya, Carabaya, 2000 feet (*Mus. Druce*).

Allied to *Racheospila calliope*, Druce, from Mexico, but very distinct.

XXXII.—*The Anatomy and Classification of the Teleostean Fishes of the Order Salmopercæ.* By C. Tate Regan, M.A.

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The order Salmopercæ includes only three genera—*Percopsis*, *Columbia*, and *Aphredoderus*—each with a single species, little fishes of the fresh waters of North America. It is an isolated group, showing resemblances to the Iniomi, Microcyprini, and Berycomorphi, but quite distinct from them all. The following description is based on examples of all three species:—

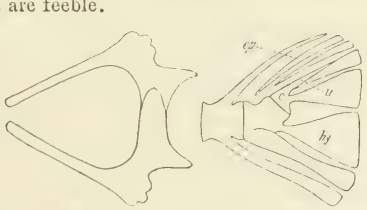
External characters.—Body moderately elongate, compressed, covered with adherent ciliated scales; lateral line complete, running along middle of side. Mouth rather small, terminal or subterminal, not or scarcely protractile, bordered above mainly by the præmaxillaries; maxillary concealed or slightly exposed distally, without supramaxillary; small villiform teeth in the jaws. Head with large muciferous cavities; interorbital region flattish; eyes lateral; two nostrils on each side. Gill-membranes attached to isthmus; 6 branchiostegals; 4 gills; pseudobranchiæ. Dorsal fin median, of 2 to 4 spines and 9 to 11 soft rays; anal of 1 or 2 spines and 6 or 7 soft rays; caudal with 18 or 19 principal rays, 16 or 17 branched; pectorals lateral; pelvics subabdominal, each of 7 or 8 rays, the outermost simple and with a rudimentary spine adnate to its basal part.

Air-bladder.—The Salmopercæ are physoclistic; I cannot find any trace of a pneumatic duct. In this I am confirmed by Dr. W. G. Ridewood, who kindly examined an example of *Columbia transmontana*.

Head-skeleton.—There are no parietal crests and the occipital crest is developed only on the posterior face of the skull; the posterior temporal fossæ are open above; the

muciferous channels on the upper surface of the head are separated in the interorbital region by a median ridge or pair of ridges formed by the frontals and continued forward on the mesethmoid; on the snout the muciferous channels lie in the large thin nasal bones, which are concave, with both outer and inner edges raised, the latter nearly or quite meeting above the ethmoidal ridge. The parietals are separated by the supraoccipital; the otic bones are all well developed; the exoccipital condyles are contiguous; there is a thin-walled auditory bulla formed mainly by the basioccipital, exoccipital, and pro-otic; there is no basisphenoid, and the pro-otics do not form a roof for the myodome; the alisphenoids do not meet in the middle line, and there is no orbitosphenoid. The præorbital and suborbitals are ossified, without subocular shelf; there is no supraorbital; the opercular and hyopalatine bones are all present and normally developed; the palatine is attached to the head of the vomer and has a maxillary process; the præmaxillaries have short pedicels which lie between the proximal ends of the maxillaries; the latter are broadest distally and have no supramaxillaries; the lower jaw is formed of dentary, articulare, and angulare. The lower pharyngeals are coalescent by their inner edges; there are 3 separate dentigerous upper pharyngeals on each side.

Vertebral column.—There are 30 to 36 vertebræ (13–17 + 17–19); the centra and arches are co-ossified; most of the præcaudals have rather strong transverse parapophyses; the ribs are strong, mostly inserted on the parapophyses; the epipleurals are feeble.



A. B.

Columbia transmontana.—A. Pelvic bones. B. Caudal fin skeleton. *ep*, epurals (epaxial basalia); *hy*, hypurals; *c*, last centrum; *u*, urostyle.

Skeleton of caudal fin.—The caudal fin skeleton (fig. B) shows one feature of generalization, in that the hypurals of the upper and lower lobes are attached to separate centra; in other characters it is highly specialized, for the hypurals are few and the uroneurals are reduced, ankylosed with each other and with the last centrum, forming a urostyle.

Skeleton of paired fins.—The post-temporal is forked, attached to the epiotic above and the opisthotic below; the hypercoracoid is perforate and the hypocoracoid is narrowed forward below, meeting the cleithrum at or above the symphysis; there is no mesocoracoid; there are 4 hourglass-shaped radials, only the lowest on the hypocoracoid; the post-cleithrum is single, laminar above, and slender and rod-like below; the pelvic bones are connected with the post-cleithra; they are formed of transverse portions which broadly overlap and are united, and of rather slender processes which converge anteriorly (fig. A).

Two families may be recognized:—

1. Percopsidæ.

An adipose fin. Caudal of 19 principal rays, 17 branched; pelvics 8-rayed. Vent just in front of anal fin. Palate toothless. Vertebræ 34 to 36 (16–17+17–19).

Two genera: *Percopsis* and *Columbia*.

2. Aphredoderidæ.

No adipose fin. Caudal of 18 principal rays, 16 branched; pelvics 7-rayed. Vent at the throat (in the adult). Teeth on vomer and palatines. Vertebræ 30 (13+17).

A single genus: *Aphredoderus*.

Jordan and Evermann (Bull. U.S. Nat. Mus. xlvii. 1896, pp. 782–786) recognize to a certain extent the relationship between these two families, but make each the type of a separate order; their idea that these fishes may be rather closely related to the Percoid families Percidæ and Centrarchidæ is not confirmed by a study of the anatomy. Boulenger, in the 'Cambridge Natural History' (1904), includes the Percopsidæ in the heterogeneous group Haplomi, whilst *Aphredoderus* is placed in the Berycidæ. Starks (Proc. U.S. Nat. Mus. xxvii. 1904, p. 603) has noted some of the characters which separate *Aphredoderus* from the Berycoids.

MISCELLANEOUS.

Royal Institution.

Professor Karl Pearson being unable to lecture at the Royal Institution on March 3, the Friday Evening Discourse on that date will be delivered by Dr. F. A. Dixey, his subject being "Scents of Butterflies."

THE ANNALS

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XXXIII.—*Notes on Fossorial Hymenoptera.*—III.

By Roland E. Turner, F.Z.S., F.E.S.

On some Species of Thynnidæ, Scoliidæ, *and* Sapygidæ.

Unless otherwise mentioned, the insects described in this paper are in the National Collection at South Kensington. Some are in the collection of the Berlin Museum.

Family **Thynnidæ**.

Spilothynnus tucumanensis, sp. n.

♀. Nigra, abdominis segmento primo macula mediali, segmentis 2–5 maculis lateralibus flavis, segmento primo antice producto, tuberculato; pedibus pallide testaceis.

Long. 8 mm.

Head nearly as long as the anterior breadth, strongly rounded posteriorly, closely and rather deeply punctured, slightly convex, depressed anteriorly, with a shining, slightly concave area between the eyes and the base of the antennæ. Thorax very narrow; the pronotum as long as the breadth on the anterior margin, slightly narrowed posteriorly, shining, with a few scattered punctures, the anterior angles prominent and subtuberculate, a short longitudinal groove from the anterior margin, the sides strongly depressed near the posterior margin; scutellum and median segment shining, very narrow; the median segment depressed and flattened, longer than broad. Abdomen narrowed at the extremities,

the first segment shining and sparsely punctured, narrowed towards the base and produced into a bluntly rounded prominence which projects over the apex of the median segment; second segment slightly broadened from the base, with three well-marked transverse carinæ, in addition to which the apical margin is slightly raised; the remaining segments shining and very sparsely punctured; pygidium almost vertically truncate, the surface of the truncation rugose, small and ovate, the ventral plate projecting beyond the dorsal and pointed at the apex. Ventral segments sparsely punctured, most deeply on the fifth.

Black; the first dorsal abdominal segment (except at the base and on the middle of the apical margin), a small spot on each side near the base of the second segment, a large spot on each side on the third and fourth segments, and a small spot on each side of the fifth segment yellow; legs testaceous brown; mandibles and antennæ fuscous.

Length 8 mm.

Hab. Tucuman, N. Argentina (*Steinbach*).

Type in Berlin Museum.

The shape of the first abdominal segment somewhat recalls *S. bituberculatus*, Turn.

Parelaphroptera rollei, Turn.

Pseudelaphroptera rollei, Turn. Trans. Ent. Soc. London, p. 72 (1908). ♂.

Parelaphroptera rollei, Turn. Wytsman's Genera Insectorum, cv. p. 21. ♂.

♀. Mandibles simple, not bidentate; clypeus without a carina, the anterior margin transverse. Head distinctly broader than long, slightly narrowed anteriorly, the posterior angles rounded, shining and almost smooth, with a very short frontal sulcus, the position of the ocelli indicated by shallow and rather indistinct punctures, the cheeks produced at the base of the mandibles into a blunt tubercle notched at the apex. Antennæ short, the length of the flagellum not exceeding the length of the head. Pronotum nearly twice as broad as long, the sides parallel, almost as broad as the head, finely and closely punctured; scutellum much broader than long, narrowed towards the apex and sparsely punctured; median segment as long as the pronotum, broadened from the base, very steeply sloped posteriorly, sparsely punctured. First abdominal segment vertically truncate at the base, much shorter than the second and not much narrowed anteriorly; second segment with a low carina near the base, another, higher, near the apex separated by a deep groove from the

raised apical margin, the space between the basal and pre-apical carinæ indistinctly transversely rugulose; the remaining segments very sparsely punctured. Pygidium not compressed or narrowed, the greatest breadth nearly as great as the length, rather narrowly rounded at the apex. Intermediate tibiæ broad, tarsal ungues toothed.

Brownish black; tibiæ and tarsi testaceous; a line on the posterior margin of the pronotum, the posterior margin of the scutellum, and a transverse band on the dorsal abdominal segments 1–5, narrowly interrupted in the middle on segments 3–5 and broadly interrupted on the second segment, pale yellow.

Length 10 mm.

Hab. La Paz, Mendoza (*Jensen-Haarup*).

This species differs considerably in both sexes from *P. flavomaculata*, André, the type of the genus, especially in the absence of lateral spines on the hypopygium of the male and in the sculpture of the second abdominal segment in the female.

Anodontyra haarupi, Turn.

Pseudelaphroptera haarupi, Turn. Ann. & Mag. Nat. Hist. (8) iii. p. 133 (1909). ♀.

Parelaphroptera haarupi, Turn. Wytsman's Genera Insectorum, cv. p. 21 (1910). ♀.

I was wrong in placing this species in my genus *Parelaphroptera*, and also in my suggestion that it might prove to be the female of *P. rollei*, Turn. I have now received specimens of the male, and there can be no doubt that the insect should be placed in the nearly related genus *Anodontyra*, Westw.

♂. Mandibles bidentate, the outer tooth much longer than the inner. Clypeus slightly produced and rather narrowly truncate at the apex, moderately convex, shining and almost smooth. Antennæ about as long as the thorax and median segment combined, the apical joints slightly arcuate beneath, the third joint of the flagellum longer than the second. Head finely and very closely punctured, covered sparsely with short grey pubescence. Thorax and median segment finely and rather closely punctured, the scutellum and postscutellum almost smooth, shining; pronotum strongly rounded at the anterior angles; median segment steeply sloped posteriorly. Abdomen strongly but not very closely punctured, not very slender, tapering slightly to the extremities; a deep transverse groove close to the base of the second dorsal segment; seventh dorsal segment narrowed

to the apex; hypopygium short and not very narrow, projecting very little beyond the dorsal segment and truncate at the apex. Third abscissa of the radius a little longer than the second; first recurrent nervure received at two-thirds from the base of the second cubital cell, second at one-fifth from the base of the third cubital cell, the division of the first cubital cell incomplete.

Black; the mandibles at the base, the clypeus (except a narrow transverse line near the apex), pronotum (except a narrow transverse band on the sides, not nearly reaching the middle), a large spot on the mesonotum, tegulæ, scutellum (except the margins), postscutellum, a broad, undulating, transverse band on the median segment, mesopleuræ, a band broadly interrupted in the middle on dorsal segments 2–6, a spot on each side on the first dorsal segment, a narrower band on ventral segments 2–4, the femora beneath and the tibiæ above bright yellow; tibiæ beneath and tarsi testaceous brown. Wings hyaline; nervures testaceous at the base, black at the apex.

Length 17 mm.

Hab. La Paz, Mendoza (*Jensen-Haarup*).

On a second specimen the yellow markings, especially on the median segment and abdomen, are more developed than in the specimen described.

Genus Eucyrtothynnus, Turn.

Eucyrtothynnus, Turn. Wytsman's Genera Insectorum, cv. p. 24 (1910).

In this genus should be included several species placed provisionally in *Elaphroptera* in my paper, Zool. Jahrb. xxix. 2, 1910, viz. *E. rosenbergi, E. anisitsi, E. acutidentata, E. obfuscata*, and, with much doubt, *E. mapirensis* and *E. inferna*. *E. steinbachii* might be included in the genus *Chrysothynnus* provisionally, which might also include *E. bogotana, E. mimula*, and probably also *E. deserta* and *E. desponsa*, but none of them are very near the typical species *C. inca*, Turn., of which the female is still unknown.

Eucyrtothynnus heymonsi, sp. n.

♂. Niger, mandibulis, clypeo, marginibus oculorum, pronoto, macula magna scutelli, postscutello, segmenti mediani fasciis duabus longitudinalibus, maculisque lateralibus segmenti 1mi, 2ndi, 3tii quartique flavis; alis subhyalinis, nervulis fuscis; clypeo emarginato.

Clypeus slightly produced, shallowly emarginate at the apex, the emargination not very broad, but extending over

the whole apical margin, the angles only slightly produced, a narrow transverse depression on the middle of the clypeus, the apical half slightly porrect. Mandibles bidentate, the outer tooth acute, the inner very broadly truncate. Antennæ as long as the head, thorax, and median segment combined, the apical joints slightly arcuate. Head and thorax finely and closely punctured, abdomen more sparsely punctured and shining. Median segment as long as the breadth at the base. Abdomen rather slender: the first segment gradually broadened from the base; seventh dorsal segment narrowly truncate at the apex, the lateral margins raised; hypopygium short and narrow, rounded at the apex. Third abscissa of the radius a little longer than the second, the second recurrent nervure received at one-third from the base of the third cubital cell.

Black; the mandibles (except at the apex), clypeus (except the depressed line on the middle), the frontal prominences above the antennæ, the margins of the eyes very narrowly (except at the summit), a line on each side on the posterior margin of the head, the margins of the pronotum, a small spot on the tegulæ, a small spot on the mesopleuræ, a large spot on the scutellum and a small one at each of the anterior angles, a line on the postscutellum, a broad longitudinal band on each side on the median segment, a large spot on each side on dorsal abdominal segments 1–4, and a line on the anterior tibiæ beneath yellow; anterior tarsi luteous. Wings shaded with fuscous, a little more deeply in the radial cell than elsewhere; nervures fuscous, stigma testaceous.

Length 13 mm.

Hab. Tucuman, N. Argentina (*Steinbach*).

Type in Berlin Museum.

Near the group of *E. maculipennis*, Guér., but is a less robust species, the clypeus is more produced and much narrower at the apex, and the difference in colouring is considerable.

Genus Thynnus.

The species placed in this genus in my paper on the Thynnidæ of the Hungarian Museum (Ann. Mus. Nat. Hung. viii. 1910) were not published in time for inclusion in my revision of the family in Wytsman's 'Genera Insectorum.' The following changes in the generic names are necessary:—*Thynnus* (*Zeleboria*) *compar* should be placed in *Neozeleboria*, Rohw. (*Zeleboria*, Turn.); *T.* (*Æolothynnus*) *exiguus* and *T.* (*Æolothynnus*) *lactarius* should be included

in *Asthenothynnus*, and *T. rufoluteus*, *T. conator*, and *T. birói* in *Zaspilothynnus*.

Family Scoliidæ.

Subfamily *Myzininæ*.

Myzine (*Pseudomeria*) *dakarensis*, Buyss.

Pseudomeria dakarensis, Buyss. Soc. Linn. Bordeaux, p. 340 (1910). ♀.

Specimens from Mogador differ in having the whole of the legs red, instead of only the tibiæ and tarsi, and the absence of white hairs on the scape and posterior margin of the head. They may possibly represent a distinct species, but I have not seen specimens of *dakarensis*, and the differences do not seem sufficient to be of specific importance.

Hab. Mogador (*Escalera*). December and March.

Myzine (*Pseudomeria*?) *mogadorensis*, sp. n.

♂. Niger, punctatus, clypei apice, marginibus prothoracis, mesonoti macula quadrata, scutelli maculis duabus, postscutelli macula, fasciisque latis apicalibus segmentorum abdominis flavis; pedibus ferrugineis, flavo-variegatis; segmenti septimi angulis apicalibus acutis.

Antennæ about half as long again as the head, thorax, and median segment combined. Clypeus widely and shallowly emarginate at the apex; head, thorax, and median segment closely punctured and rather sparsely clothed with long greyish pubescence, a small space below the anterior ocellus smooth and shining; the anterior margin of the pronotum transverse. Abdomen shining, finely and shallowly punctured, rather robust, the segments not constricted, the basal segment short and almost sessile; the emargination of the seventh dorsal segment broad, but not very deep, distinctly broader at the apex than deep, the angles at the apex pointed, the dorsal surface of the segment before the emargination with a short median longitudinal groove. Third abscissa of the radius no longer than the second, radial cell rounded at the apex.

Black; the clypeus at the apex (sometimes entirely), the margins of the pronotum, interrupted in the middle on the anterior margin, a quadrate spot on the mesonotum (sometimes obsolete), a spot on each side on the scutellum (sometimes obsolete), a transverse spot on the postscutellum, a spot on the mesopleuræ below the anterior wings, the tegulæ, and a transverse apical band, broadest on the sides, on all the

dorsal abdominal segments and on ventral segments 2–7, often enclosing a brown spot on each side on the ventral segments, yellow; legs light ferruginous marked with yellow. Wings hyaline, nervures black, the stigma pale ferruginous.

Length 11–16 mm.

Hab. Mogador, S.W. Morocco (*Escalera*). March.

In the pointed angles of the seventh dorsal segment this species resembles *lacteipennis*, E. Saund., from Algeria. From the date of capture and the locality I consider that it is probably the male of *Pseudomeria dakarensis*, but it would be unjustifiable to place them together without more conclusive evidence. In some specimens the third abscissa of the radius is much shorter than the second; the details of neuration in *Myzine* cannot be relied upon for specific characters, slight differences often occurring on the different sides of the same specimen. I do not look on *Pseudomeria* as of more than subgeneric importance.

Myzine oraniensis, Luc.

Myzine oraniensis, Luc. Explor. sc. Algérie, Zool. iii. p. 284 (1846). ♂.

Hab. Morocco City (*Escalera*). April, 1 ♂.

The specimen differs from an Algerian specimen in the British Museum in having a black spot at the apex of the clypeus, the punctures on the abdomen not quite as distinct, and the third abscissa of the radius more distinctly shorter than the second, especially on the left anterior wing.

Myzine fasciculata, E. Saund.

Myzine fasciculata, E. Saund. Trans. Ent. Soc. London, p. 533 (1901). ♂.

Two specimens from Morocco City differ from the type in having the antennæ black, the base and sides of the clypeus only yellow, a yellow spot on each side above the antennæ, the apex and sides of the seventh dorsal segment narrowly margined with yellow, the radial cell shorter and the stigma shorter and broader and of a darker colour, there is also a large yellow spot on the mesopleuræ.

These probably represent a subspecies, but longer series of both forms are required as well as the opposite sex.

Elis (*Mesa*) *ruficeps*, Sm.

Myzine ruficeps, Sm. Cat. Hym. B. M. iii. p. 75 (1855).

This species may be divided into several subspecies,

differing slightly in colour, though not always very constant: (1) *E. ruficeps,* Sm., the typical form, is from Natal; (2) *E. ruficeps diapherogamia,* Sauss., from the south of the Transvaal; (3) *E. ruficeps atopogamia,* Sauss., from Lake Nyasa. Other forms which are nearly related and will probably prove to be subspecies are *E. adelogamia,* Turn., from Basutoland; *E. heterogamia,* Sauss., which ranges from Delagoa Bay to Mlangi in South Nyasaland; and *E. hova,* Turn. (*nodosa,* Guér., ♀?), from Madagascar. If the latter is included, *nodosa* will have to be used as the specific name. I am able to associate males with the three subspecies given, though only on circumstantial evidence.

The following key will serve to distinguish the nearly allied forms in both sexes :—

♀ ♀. A. Wings hyaline, slightly tinted with fuscous. Legs black	*E. heterogamia,* Sauss.
B. Wings fuscous, more or less glossed with blue or purple.	
a. Legs black.	
a^2. Front and scape black	*E. adelogamia,* Turn.
b^2. Front and scape red	*E. hova,* Turn.
b. Legs red.	
a^2. Pronotum black, except on the posterior margin; mesonotum and scutellum black	*E. ruficeps ruficeps,* Sm.
b^2. Pronotum and scutellum red.	
a^3. Mesonotum almost entirely black.....	[*gamia,* Sauss. *E. ruficeps diaphero-*
b^3. Mesonotum red	*E. ruficeps atopogamia,* [Sauss.
♂ ♂. A. Posterior tibiæ and tarsi testaceous. Wings clear hyaline, without blue gloss	*E. nodosa,* Guér.
B. Posterior tibiæ and tarsi black above, sometimes ferruginous beneath.	
a. Wings hyaline, slightly glossed with blue	*E. ruficeps diapherogamia,* Sauss.
b. Wings strongly shaded with fuscous.	(=*disjuncta,* Turn.).
a^2. Abdomen finely but distinctly punctured, with short pubescence.....	*E. ruficeps ruficeps,* Sm.
b^2. Abdomen obsoletely punctured at the base, shining and with less pubescence	[Sauss. *E. ruficeps atopogamia,*

The comparative length of the second and third abscissæ of the radius does not seem to be quite constant in either sex, but the second abscissa is shorter in *hova* and *diapherogamia* than in the other forms. *Hova* also differs in being more closely punctured. In *nodosa,* Guér., the basal abdominal segment is much more slender than in the other forms.

In all the males the apical dorsal segment is shallowly incised at the apex.

Elis (*Mesa*) *ametalla*, sp. n.

♂. Front longitudinally rugose, vertex punctured; clypeus and front below the base of the antennæ rather densely clothed with white pubescence; scape strongly punctured beneath, the third joint of the flagellum longer than the second; antennæ as long as the head, thorax, and median segment combined. Thorax closely punctured, much narrower than the head; the anterior margin of the pronotum straight and slightly raised, with prominent angles; mesonotum longer than the pronotum. Median segment coarsely rugose. Abdomen very slender; the first segment half as long again as the posterior femur and trochanter combined, the basal half forming a narrow petiole flattened on the dorsal surface, the apical half swollen, contracted at the apex; second segment about half as long as the first, twice as wide at the apex as at the base; third segment a little longer than broad. Seventh dorsal segment almost pointed at the apex, not incised. The whole abdomen subopaque, minutely punctured and thinly covered with delicate whitish pubescence. Third abscissa of the radius more than half as long again as the second; first recurrent nervure received beyond the middle of the second cubital cell, second just beyond one quarter from the base of the third cubital cell.

Black; the apical half of the clypeus, an interrupted line on the posterior margin of the pronotum, a transverse line on the apical margin of the third, fourth, and fifth dorsal segments of the abdomen, a transverse spot at the apical angles of the second and sixth segments, a line on the anterior femora and on the anterior and intermediate tibiæ, the anterior tarsi and the basal joint of the intermediate and posterior tarsi pale yellow. Abdomen without blue reflections. Wings clear hyaline, nervures black.

Length 11–14 mm.

Hab. Mlanji Boma, Nyasaland; 2400 ft. (*S. A. Neave*). 26 April–5 May, 1910. Three specimens.

Almost certainly the male of *E. innotata*, Turn., which was taken in considerable numbers at the same time. *E. heterogamia*, Sauss., a larger species, also occurs more sparingly in the same locality.

Very near *E. asmarensis*, Turn., but the second and third dorsal segments are more elongate in the present species, the third abscissa of the radius is longer, and the seventh dorsal segment is without a carina.

Elis varicolor, sp. n.

♀. Nigra, nitida, sparsissime punctata, capite pallide ferrugineo; prothorace, macula magna mesonoti, tegulis, macula scutelli, linea postscutelli, macula magna mesopleurarum, tibiis tarsisque anticis aurantiacis; maculis lateralibus segmentorum abdominis (sexto excepto) flavis; alis subhyalinis, venis fuscis.

Long. 16 mm.

Clypeus shining, deeply punctured at the base. Head shining, the vertex and ocellar region smooth, front closely punctured, prominent above the base of the antennæ and divided by a short, shallow, longitudinal sulcus. Scape shining, very sparsely punctured. Pronotum and mesopleuræ coarsely but not closely punctured, mesonotum and scutellum very sparsely punctured; median segment almost smooth, with a coarsely punctured space near the middle of the apical margin, the sides of the segment indistinctly obliquely striated. Abdomen shining, with a few scattered punctures towards the apex, the apical segment finely longitudinally striated. Radial cell very narrowly rounded at the apex, the second abscissa of the radius nearly half as long again as the third, cubitus of the hind wing interstitial with the transverse median nervure.

Black; the head pale ferruginous red; pronotum, a large spot on the mesonotum, another on the scutellum, a transverse line on the postscutellum, the tegulæ, a large spot on the mesopleuræ, and the anterior tibiæ and femora orange; a large spot on each side of abdominal segments 1–5 yellow; calcaria whitish. Wings hyaline, tinged with yellow, nervures fuscous.

Hab. Brazil (*Sello*).

Type in the Berlin Museum.

Elis frontalis, Burm.

Plesia frontalis, Burm. Stett. ent. Zeit. xxxvii. p. 177 (1876).

Hab. Cordova (*Burmeister*); Salta (*Steinbach*).

Elis ephippium, Fabr.

Tiphia ephippium, Fabr. Ent. Syst. ii. p. 228 (1793).

Hab. Porto Rico; St. Thomas; St. John (Berlin Museum).

Subfamily *Tiphiinæ*.

Epomidiopteron elegantulum, Sm.

Epomidiopteron elegantulum, Sm. Journal of Entomology, i. p. 79 (1860).

There is some confusion about this name, the specimen

marked as the type in the British Museum collection being *E. julii*, Rom., which does not at all agree with the description. In Smith's collection I found under the name *E. elegantulum* two specimens of *Elis obscura*, Fabr., which answer well to the description. I am inclined to think that Smith's label must have been shifted accidentally in the Museum collection, and that *elegantulum* should be treated as a synonym of *Elis obscura*, Fabr.

Tiphia gigantea, sp. n.

♀. Nigra, nitidissima, sparse punctata, segmento dorsali sexto longitudinaliter rugoso; alis fuscis.
Long. 16–19 mm.

Clypeus depressed, transverse at the apex, shining, finely punctured at the base. Head shining, very sparsely punctured on the vertex and round the ocelli, more closely on the front; posterior ocelli nearly twice as far from the eyes as from each other; scape shining, with long pale fulvous hairs beneath; the apical joint of the flagellum rather slender, narrowed to the apex and longer than the penultimate joint. Pronotum sparsely punctured anteriorly, with a broad smooth area posteriorly separated from the anterior portion by a slightly depressed, arched row of deep punctures. Mesonotum and scutellum shining, with a few scattered punctures; tegulæ large and smooth; pleuræ sparsely punctured. Median segment smooth, subopaque, the margins sharply defined, nearly half as broad again as long, with three longitudinal carinæ, the outer ones almost parallel and separated from each other by a distance equal to about one-third of their length, the sides of the segment obliquely striated, the face of the posterior truncation opaque, shallowly punctured at the base. Abdomen shining, the segments sparsely punctured at the base and the apex, more strongly on the fourth and fifth segments; the basal segment short, almost smooth, without a carina at the base, the second segment slightly constricted at the base; the sixth dorsal segment longitudinally punctured-rugose, the sides of the apical segments with rather sparse whitish pubescence. First transverse cubital nervure short, the second three times as long and slightly curved inwards in the middle. First recurrent nervure received at the middle of the first cubital cell, second just before three-quarters from the base of the second cubital cell; stigma very small.

Black; the apex of the sixth dorsal segment dark reddish brown. Wings rather pale fuscous, nervures black.

Hab. Petropolis, Brazil. August and October.

Type in the Berlin Museum.

Much larger than any other known S.-American species of the genus. It closely resembles large specimens of *T. ornata*, Say, but is much more sparsely punctured, the median segment is longer, the base of the second dorsal segment is without longitudinal striæ, and the wings are somewhat longer and darker. It is more sparsely punctured than either *T. montezuma*, Cam., or *T. parallela*, Sm., and the apical joint of the flagellum in the latter species is much stouter.

Subfamily *Cosilinæ*.

Anthobosca carbonaria, Burm.

Myzine carbonaria, Burm. Stett. ent. Zeit. xxxvii. p. 168 (1876). ♀.

In a Brazilian specimen in the Berlin Museum the colour of the hairs near the apex of the sixth dorsal segment is bright fulvous. In another specimen from Nova Freiburg the colour is much more obscure.

Subfamily *Scoliinæ*.

Scolia (*Dielis*) *palauensis*, sp. n.

♀. Nigra, nitida, sparse punctata, abdominis segmento dorsali primo fascia apicali lata, secundo fascia longitudinali laterali, tertio maculis lateralibus flavis, segmentis 2–4 apice flavo-fasciatis; alis subhyalinis.

Long. 19 mm.

♂. Niger, clypeo, pronoto, maculis duabus scutelli, fascia post-scutelli, pleuris, pedibus, fasciis apicalibus segmentorum 1–4 flavis, abdomine cæruleo micante; alis subhyalinis.

Long. 16 mm.

♀. Clypeus rounded at the apex, smooth and shining, punctured on the sides, with sparse cinereous pubescence. Head shining, very sparsely punctured, smooth round the ocelli, closely punctured above the base of the antennæ. Thorax shining, sparsely punctured; the posterior slope of the median segment smooth and subopaque; pleuræ almost smooth, covered with very short and delicate pubescence. Abdomen shining, with a few scattered punctures; segments 3–5 with a short fringe of fulvous pubescence at the apex; the sixth dorsal segment coarsely rugose, covered with stiff fulvous hairs.

Black; the abdomen with faint blue reflections; a broad transverse band at the apex of the first dorsal segment, a narrow band at the apex of segments 2–4, the sides of the

second segment, and a spot on each side of the third segment yellow. Wings subhyaline; nervures fuscous.

♂. Head and thorax subopaque, more closely and finely punctured than in the female, and thinly covered with short greyish pubescence; abdomen strongly but rather sparsely punctured, the first segment longer than the greatest breadth.

Black; the abdomen with strong blue reflections; clypeus, the scape beneath, a transverse band interrupted in the middle on the scutellum, a band on the postscutellum, the pronotum, the greater part of the pleuræ and the legs yellow, an apical band on segments 1–4, very broad on the first segment and continued on the ventral surface, brownish orange, ventral surface of abdomen and three apical dorsal segments dull testaceous brown. Wings subhyaline, nervures fuscous; the radial cell very broadly rounded at the apex.

Hab. Palau Islands (*Semper*).

Types in Berlin Museum.

Family Sapygidæ.

Sapyga morawitzi, sp. n.

♀. Flava, vertice, mesonoto, macula mediali flava, scutelli postscutellique marginibus, segmenti medialis apice, mesosterno, abdominisque segmentis basi et apice ferrugineis; antennis pallide ferrugineis, scapo flavo; alis hyalinis, venis fuscis; clypeo margine apicali dentibus binis armato.

Long. 12 mm.

♀. Clypeus coarsely and closely punctured, with two teeth near the middle of the apical margin. Antennæ a little longer than the head and thorax without the median segment, the second joint of the flagellum as long as the scape and slightly longer than the third joint; the apical joints distinctly longer than broad. Head, thorax, and median segment closely and coarsely punctured; the metapleuræ shining and much more shallowly punctured, not striated. Dorsal segments of the abdomen finely and closely punctured-rugulose, much more finely so on the ventral segments. Tegulæ shining, with a few punctures. Submedian cell a little longer than the median, third abscissa of the radius more than twice as long as the second, first recurrent nervure received just before the middle of the second cubital cell, second at about one-eighth from the base of the second cubital cell.

Pale yellow; the flagellum and the femora above pale ferruginous; vertex, the area round the ocelli, mesonotum

except a yellow median spot, spots on the pleuræ above the coxæ, the margins of the scutellum and postscutellum, the mesosternum, a triangular spot at the apex of the median segment, and the base and apex of each of the abdominal segments rather broadly above, more narrowly beneath, dull ferruginous. Wings hyaline; nervures fuscous, testaceous at the extreme base.

♂. As in the female; but the margins of segments 4–7 are black instead of ferruginous. The first recurrent nervure is received at the middle of the second cubital cell, the second at one-quarter from the base of the third cubital cell. The submedian cell is no longer than the median. In both sexes the mandibles are black at the apex.

Length, ♀ 12 mm., ♂ 16 mm.

Hab. S.W. Persia (*Escalera*).

Very near *S. glasunovii*, Mor., but in the present species the second joint of the flagellum is distinctly longer than the third, the tegulæ are less strongly punctured, the metapleuræ are not striated, the colour also differs considerably. I have not seen specimens of *glasunovii*, and it is possible that the differences may prove to be of subspecific rather than of full specific importance. The slight differences in neuration between the sexes are remarkable.

The ♀ is the type.

XXXIV.—*Descriptions and Records of Bees.*—XXXV.

By T. D. A. Cockerell, University of Colorado.

Xylocopa amethystina sigiriana, subsp. n.

♂.—Face very narrow, facial quadrangle at least twice as long as broad; all of face below antennæ, and a small bilobed spot on labrum, ivory-colour; flagellum, except first joint, dark red beneath; vertex with a tuft of white hair; hair of cheeks white; hair of thorax in front broadly, and of pleura except the uppermost part, white, that of thorax dullish and rather yellowish; hair of metathorax all black; light hair of anterior legs white, and a little white hair on outer side of middle tarsi. Abdomen with shining white hair beneath. Wings translucent, strongly stained with brown, especially in the region of the marginal and submarginal cells, and the apex, the veins and parts immediately adjacent shining brilliant purple. Hind legs quite ordinary;

hind femora not incrassate and without any lobe or tooth, hind tibiæ not arched.

♀.—Black, with the wings very dark fuliginous, very brilliantly purple throughout; face black, clypeus strongly punctured, with a median carina; a strong keel extending from middle ocellus to level of antennæ; hind tibiæ very short and thick; second s.m. in both sexes short.

Hab. Sigiri, N.W. India, March 1910 (*E. Comber*). One male (type) and two females in British Museum.

This agrees with *X. amethystina* as defined by Bingham, except in the colour of the hair of the male, the paler wings of that sex; and in the female the more carinate clypeus and front. Bingham's *amethystina* is presumably the species of Fabricius, but it is not the *amethystina* of Lepeletier, which has quite different hind legs in the male. Bingham wrongly places *minuta*, Lepeletier, as a synonym of *amethystina*, it really belongs to *X. cyanescens*. *X. ignita*, Smith, based on a female, is doubtless *amethystina*. In the female this species exactly imitates *Anthophora violacea*, Lepeletier, which was taken by Mr. Comber at Karachi, N.W. India.

Crocisa takaonis, sp. n.

Black, with white markings; in size and appearance exactly like *C. ramosa*, Lep., but differing as follows: scutellum with a white apical hair-patch, as well as white hair projecting from beneath; apical plate of abdomen strongly keeled; mesothorax and scutellum more finely punctured; white ⌊ on each side of first abdominal segment thicker, its inner angle rounded. By having the third antennal joint in the female equal to the fourth, and a patch of hair at apex of scutellum, *C. takaonis* resembles *C. affinis*, Mor., but the male antennæ are not unusually short or thick, the flagellar joints being, as usual, longer than broad. The hind femora of the male have rounded compressed lobes beneath, but are not dentate. The wings are very dark; the lower part of the pleura is black, with a white spot.

Hab. Takao, Formosa, two of each sex (*Sauter*). Berlin Museum. The dates of capture are Oct. 11 and 30, Nov. 2 and Dec. 1, 1907.

A *Crocisa* from Foochow, China (*H. R. Caldwell*), is between this species and *C. ramosa*. Like *ramosa*, it lacks the white hair-patch on the scutellum; the apical plate of the abdomen has a weak keel; the mesothorax and scutellum are punctured as in *takaonis*, but the second abdominal segment is less closely punctured; white markings on first

abdominal segment practically as in *takaonis*; the margins of the scutellar incision are curved, producing a ⌒, not practically straight as in *takaonis*.

Crocisa amata, sp. n.

Length 9 to 13 mm.

Black with very brilliant but not shining turquoise-blue markings: runs in my table in 'Entomologist,' Aug. 1910, to *C. decora*, Smith, to which it is very closely allied. Compared with a Singapore example of *decora*, it differs as follows: markings a little lighter, with a faint greenish shade, occasionally almost white; basal band of first abdominal segment very thick in middle, projecting from beneath scutellum, but sublaterally interrupted or much narrowed (in *decora* thick and even, with a linear median interruption); sublateral discal spots of thorax smaller.

Hab. Formosa (*Sauter*). Berlin Museum.

I have before me 37 males and 27 females; the type is a male from Takao. The localities and dates are Takao, Oct. 11, 19, 30, Nov. 2, Dec. 5, 15, 1907; Kanshi, June 8, 1908; Fuhosho, July 1909; Kanshirei, June 8, 1908.

This is a blue-marked species, with the hind femora of the male bearing a large, sharp, thorn-like tooth, in all respects very close to the mainland *C. decora*. I should have thought it a variety of *decora*, had I received only a single specimen, but the very long series holds its characters well, slight as they are. In the 'Entomologist,' 1910, p. 219, I expressed some fear that I might not have correctly identified *decora*; but since then Mr. Meade-Waldo has examined Smith's type (a female from N. China) for me, and returns to me one of the specimens from Singapore I had considered *decora*, assuring me that it is a true exponent of the species. Mr. Meade-Waldo adds: "*decora* is certainly marked with strong, dark blue (not the pallid wash of Transcaspian specimens of the genus *Crocisa*); the bands on the abdomen, viewed from above, almost meet (rather more so than in Singapore specimen); the mesothoracic spots are far from the prothoracic band, a line drawn through the extreme anterior edge of the tegulæ would just pass through the hinder edge of the mesothoracic spots."

Crocisa kanshireana, sp. n.

Length about 12 to 14 mm.

Black with cobalt-blue markings, which are not at all shining; scutellum ⌒-like, with a blue apical patch.

Abdomen in male with purple and green tints; basal band of first abdominal segment narrow, slender, often interrupted in middle; apical band of first segment also rather slender, interrupted in middle line by a space about equal to distance from notch in scutellum to one of its lateral points; bands of first segment not united at sides; the other bands, four in number, are transverse, interrupted about as widely as that on apex of first segment; median stripe of mesothorax going back about to middle; discal spots small, isolated; mesothorax with much black hair; pleura crossed by a blue band, narrowed in middle. Wings very dark; apex of male abdomen with three low lobes (in *C. amata* truncate, with a tooth-like pencil of hair on each side); hind femora of male unarmed; hind tibiæ with a patch of blue hair at base; hair of basitarsi black, in female with a fair amount of blue, in male with the blue reduced to a few hairs, often only on anterior tarsi.

Hab. Kanshirei, Formosa, June 8, 1908 (*Sauter*). 6 ♂; 2 ♀, in Berlin Museum.

A very closely related *Crocisa* from Foochow, China (*Caldwell*), differs by the much duller, *greyish*-blue of the abdominal markings; the W-like scutellum, without an apical blue patch; the broader median mesothoracic band; the apical band of first abdominal segment very narrowly or not interrupted, and joined at sides by a longitudinal band to the basal; and the abundant light hair on the tarsi.

In Friese's table of Oriental and Australian *Crocisa* (Ann. Mus. Nat. Hung. 1909) this runs in both sexes straight to *C. emarginata*, but it is certainly not the *emarginata* of Lepeletier, which has shining blue markings. In my table in 'Entomologist,' Aug. 1910, it runs nearest to *C. decora*, to which it is not closely allied.

It is seen from the above that Formosa contains three species of *Crocisa*, all of different groups. All are close to Chinese species, but nevertheless distinct.

Androgynella, gen. nov.

Like *Megachile*, but female with 13-jointed antennæ, and ventral surface of abdomen smooth and bare, without any trace of a scopa. Junction of third and fourth antennal joints in female very oblique. Male with short flattened anterior coxal spines or lamellæ; anterior tarsi somewhat modified. Type *Androgynella detersa* (*Megachile detersa*, Ckll.).

The species was described from a single female. Mr. R.

E. Turner examined 14 female specimens in his collection, and all had 13-jointed antennæ and wholly lacked a ventral scopa. It is therefore certain that this is a normal condition, and must represent an early stage in the evolution of a parasitic series, like those of *Cœlioxys* and *Stelis*. From the standpoint of genetics, it is an extraordinary case, since the female seems to have dropped her secondary sexual characters and thereby assumed those of the male, which were present in her gametic constitution. It is noteworthy that the sting, a modified primary character, is retained. It appears that in *Megachile* the female is heterozygous for the secondary sexual characters, with the female characters dominant.

Thus a new generic type has been produced by the simple dropping out of one set of characters. It may be objected that the insect is still essentially a *Megachile*, and this is indeed true as regards its major characters, but according to any logical system of classification it must go in a distinct generic group, as otherwise our current definition of *Megachile*, applicable to hundreds of species all over the world, breaks down.

Mr. Turner sends me the male of *A. detersa*, taken at the same tree as the female, and having the same general characters.

Male.—Length about 8 mm. Eyes green; face with abundant pale yellow hair; third antennal joint (as Mr. Turner noted) oblique at end as in the female; lower part of cheeks with very abundant snow-white hair; anterior coxæ with short flat spines; anterior tarsi reddish, the first three joints oval, flattened, especially the first, so that the posterior margin of the tarsus is strongly crenate, the tarsus also with a strong fringe of white hair behind; middle and hind tarsi also somewhat thickened, middle tarsi with a very long fringe of white hair behind; hind tibia swollen; vertex and thorax above with a good deal of black hair; abdomen short, with narrow hair-bands, the apex strongly retracted; dorsal surface of sixth segment densely covered with cream-coloured hair, margin of segment little projecting, with a broad shallow median depression; no ventral teeth or spines; claws bifid at end. The claws are also bifid at end in the female, with no basal tooth.

Heriades sauteri, sp. n.

♀.—Length about 6½ mm.

Black, superficially looking exactly like the European *H. truncorum* (L.), to which it is closely allied, differing as

follows: mandibles much shorter, the apex reaching only a little beyond middle line of clypeus; head round instead of quadrate, the occiput and cheeks less developed; cheeks in lateral view about as wide as eye. Wings hyaline, faintly greyish; b. n. falling a little short of t.-m.; abdomen beyond the second segment with a fine thin pruinose pubescence. The punctures of the abdomen are very much finer than in the American *H. carinatus,* Cresson. The ventral scopa is white.

♂.—Length about 5 mm.

Formed as in *H. truncorum,* but readily separated by the hyaline wings.

Hab. Formosa (*Sauter*). Berlin Museum. Six specimens were obtained at Takao, Sept. 29 and Oct. 11, 1907.

The genus is new to Formosa. The species is apparently related also to *H. tenuis,* Nurse, from Mt. Abu, but the tibiæ are not especially enlarged. There is no tooth at each side of the scutellum in *H. sauteri* ♀; hence in Friese's table of Palæarctic species it runs to the Egyptian *H. moricei,* Friese, from which it is at once separated by the non-dentate clypeal margin.

Megachile faceta, Bingham.

Two females in the Berlin Museum were collected by Sauter in Formosa, one at Cikutoge, May 1909. Bingham reported the species from Burma and Tenasserim; I have one from the Khasia Hills, received from Mr. Sladen.

Megachile studiosella, n. n.

Megachile studiosa, Bingham, Jn. Bombay Nat. Hist. Soc. 1898, p. 126 Simla. (Not *M. studiosa,* Cresson.)

♀.—9 mm. long.

Ventral scopa white.

Megachile (*Eumegachile*) *dinura,* sp. n.

♀.—Length about 19 mm.

Black; hair of head short and black, a little fulvous on lower part of cheeks; mandibles with a broad cutting-edge, but only two teeth; clypeus transverse, short, densely rugose, not at all keeled, lower margin straight, with a pair of small obscure tubercles in the middle; cheeks with very large punctures; vertex, mesothorax, and scutellum very densely punctured, scutellum more coarsely than mesothorax; mesothorax and scutellum almost nude, with some very short inconspicuous black hair; other parts of thorax with fulvous

hair, very dense and bright on tubercles and behind the wings; disc of anterior coxæ with black hair; tegulæ black. Wings dark fuliginous, the basal half paler and yellower. Legs black, with short fulvous and black hair, that on inner side of tarsi rufo-fu cous; hind basitarsus not especially broadened. Abdomen of the long and parallel-sided type, with fulvous hair at sides of first segment, and forming inconspicuous narrow bands, broadly interrupted in middle on the following four; surface shining, punctures on second and third segments very large; ventral scopa bright rufo-fulvous, becoming blackened on fourth segment, and entirely black on fifth and sixth; abdomen not at all metallic.

Hab. Fuhosho, Formosa, July 1909 (*Sauter*). Berlin Museum.

This looks exactly like a small example of *M. doederleinii*, Friese, but is readily distinguished by the darker wings, the eyes almost parallel (widely diverging below in *doederleinii*), and the normal (not elevated) lower margin of clypeus.

The antennæ of *M. dinura* are shorter in proportion than those of *M. doederleinii*. The structure and sculpture of the abdomen are nearly the same in both.

Comparison may also be made with *M. sculpturalis*, Smith, which has much more fulvous hair, and the abdomen with metallic tints.

Megachile conjuncta, Smith.

I have a co-type female from F. Smith's collection. The abdomen has strong purple tints, and the ventral scopa, while largely red, is white at the base and black laterally and apically; by no means "entirely bright fulvous," as Bingham has it. The mandibles are strongly arched near the apex, and the upper part of the clypeus has a longitudinal smooth band. Thus the species, while superficially just like *M. disjuncta*, is really very distinct.

Megachile disjunctiformis, sp. n.

Like *M. disjuncta*, but ventral scopa of female creamy white as far as base of fourth segment, black beyond. This is evidently nearer to *M. disjuncta* than to the Chinese *M. relata*, Smith, agreeing with *disjuncta* in sculpture, form, and the colour of the wings (compare Bingham's account of *M. relata*); in *relata* the ventral scopa is bright fulvous and black, in *disjuncta* it is all black. The hair at the base of abdomen and adjacent parts of thorax is white, as in a *disjuncta* from Deli, Sumatra (*L. Martin*); in *disjuncta* from

Madagascar and Mauritius it is ochreous. The female clypeus is formed exactly as in *disjuncta*, with the same pair of apical tubercles, but the delicate median carina is usually (not always) absent.

The male has simple anterior tarsi and tibiæ; anterior coxæ with very small spines, reddish at end; clypeus with a dense white beard, but otherwise bare and shining, with strong punctures; mesothorax with well-separated punctures; apex of abdomen obscurely bilobed. The smaller males are not over 10 mm. long, while the larger females are 18.

Hab. Formosa (*Sauter*); very many specimens. Berlin Museum.

The type is a female from Chikutoge, May 1909. Other specimens are from Takao, July to October.

Megachile takaoensis, sp. n.

♂.—Length 14 (small examples 12) mm.

Black, with abundant pale yellow hair on head, thorax, and legs, and brighter red (orange-fulvous) on abdomen; vertex and disc of mesothorax with fuscous hair; dense hair of face fulvous varying to cream-colour; head and thorax above dullish, densely punctured; tegulæ very dark brown, finely punctured. Wings subhyaline, apical margin broadly fuscous. Legs black, including tarsi; anterior tarsi more or less reddish, rather thickened, but essentially simple, with a fringe of hair behind, and the middle tarsi also fringed; anterior coxæ with short but stout black spines. Abdomen covered with red hair; sixth segment very hairy, projecting, sharp-edged, emarginate in the middle and variously subdentate, and with a strong median keel; subapically beneath is a pyramidal projection ending in a short spine, and another spine projecting from its hinder part, close to the apical emargination; stigma ferruginous, nervures mostly fuscous.

♀.—Length about 18 mm.

The abdomen covered with light red hair, the scopa entirely orange-fulvous; appearance of the African *M. fulva*, Smith, but the wings much darker, the apical half fuscous; mandibles massive, quadridentate; clypeus short and broad, very densely punctured, with a small median apical tubercle; hair of clypeus largely dark fuscous and dark reddish; flagellum short and thick; hind basitarsus little broadened, with much red hair on inner side.

Hab. Takao, Formosa (*Sauter*). Many specimens in Berlin Museum.

The type is a male taken April 18, 1907. The males were taken in April, May, and July; the females in July, September, and October.

Megachile kagiana, sp. n.

♂.—Length 14½ (small specimens 12½) mm.

Superficially exactly like *M. takaoensis,* with which I had mixed it, but easily separated as follows: hair of head and thorax above all fulvous; anterior coxæ with long black spines; anterior femora subtrigonal, keeled beneath, ferruginous, the posterior inferior face blackened; anterior tibiæ ferruginous, with the outer side black; anterior tarsi distinctly broadened, dull cream-colour stained with reddish, fringed behind with white hair, on inner side a large dark brown oval spot; sixth abdominal segment hairy and keeled, but strongly retracted, not produced, the broad margin with irregular sharp teeth; fourth ventral segment emarginate, but no evident projections.

Hab. Formosa (*Sauter*). Several in Berlin Museum.

Type from Koroton, Sept. 9, 1907.

Megachile rufovittata, sp. n.

♀.—Length about 14½ mm.

Similer to *M. takaoensis,* but shorter and proportionately broader, the abdomen shovel-shaped; abdomen appearing banded, the segments crossed by strong ridges which stand up above the pubescence; basad of these ridges the surface is densely punctured with dark red hair, apicad of them it is very densely covered with brilliant orange-ferruginous hair; ventral scopa creamy white at base, becoming deep ferruginous apically; posterior basitarsus very broad and flat; hair of vertex dark fuscous; disc of mesothorax nearly bare, with scanty short fuscous hair, but with fulvous hair along the margins; hair of front and sides of face very bright orange-ferruginous; clypeus and supraclypeal area shining, with strong punctures; clypeus not so short as in *takaoensis,* with its apical margin broadly though not deeply excavated; flagellum longer and more slender than in *takaoensis.*

Hab. Fuhosho, Formosa, July 1909 (*Sauter*). One female in Berlin Museum.

The Sauter collection from Formosa includes a great number of red-haired specimens of *Megachile,* superficially like *M. fulva.* Upon close examination it proves easy to sort

out two kinds of males and two of females. All the males described as *takaoensis* come from Takao, thirty-two specimens. Eight females from Takao evidently belong with them. The males described as *kagiana* are two from Kagi, Aug. 26, 1907; three from Koroton, Sept. 9, 1907; and one from Takao, July 21, 1907. Two females from Koroton, Sept. 9, 1907, are referred with doubt to *M. kagiana*, but I cannot find any distinct character to separate them from that sex of *takaoensis*, although the abdomen seems to have a slightly more banded appearance. A third female from Koroton, however, is fresher, and is exactly like female *takaoensis* from Takao; so either the females of these species are alike, or we do not know the true female of *kagiana* *.

M. rufovittata, from a locality not represented by males, has the abdomen shaped more as in *M. bicolor*, and can hardly be the female of *M. kagiana*. *M. rufovittata* has the antennæ formed as in *M. bicolor*, and is evidently closely allied, but the scopa is quite differently coloured. *M. fraterna*, Smith, also resembles these insects, but is easily separated from them by the black hair of the front in the female. *M. doleschalli*, Ckll., from Amboina, resembles *M. rufovittata*, but has the hair of the clypeus black, and rufo-fulvous tegulæ (those of *rufovittata* are piceous, with a patch of red hair in front).

Megachile bicolor (Fabr.).

This also occurs in Formosa, a single female having been taken by Sauter at Takao, July 26, 1907.

The ventral scopa is a rather creamy white, black on the last segment. The middle of the clypeus and the supraclypeal area are shining.

Apis nursei, n. n.

Apis testacea, Bingham, Jn. Bombay Nat. Hist. Soc. xii. p. 129. Deesa. ♀, 9 mm. (Not *A. testacea*, Smith, 1857.)

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* The reverse hypothesis could be entertained, and supported to some extent by the observation that the females were taken in July, September, and October, practically coinciding with the flight of male *kagiana*: whereas the males of *takaoensis* occurred from April to July. It seems scarcely possible, however, that the abundant species *takaoensis* should not belong with the prevalent female of the locality.

XXXV.—*The Osteology and Classification of the Teleostean Fishes of the Order Microcyprini.* By C. Tate Regan, M.A.

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[Plate VIII.]

As defined and limited in the 'Cambridge Natural History' the group Haplomi includes a number of families of soft-rayed fishes with abdominal pelvic fins, which are thrown together because they lack the mesocoracoid bone, the presence of which characterizes the order Isospondyli or Malacopterygii. It was only to be expected that further study of such a large and heterogeneous group, defined by a single negative character, would prove it to be unnatural.

I have already called attention to the fact that *Retropinna*, *Microstoma*, and *Salanx* have no mesocoracoid *, although they are closely related to the Argentinidæ, in which that bone is well developed. Moreover, *Retropinna*, which represents *Osmerus* in Australia and New Zealand, is a connecting-link between the northern family Argentinidæ and the southern Haplochitonidæ and Galaxiidæ. All these fishes are extremely similar in osteology, dentition, and other characters, and are very closely related. The Haplochitonidæ and Galaxiidæ, then, are not Haplomi, although they have lost the mesocoracoid; they are Salmonoids.

The third family of the Haplomi in the 'Cambridge Natural History' is the Enchodontidæ, Cretaceous fishes which seem to me to be related to the Stomiatidæ, which they resemble in mouth-structure and in cranial osteology.

I have already dealt with the osteology and classification of many of the other groups included in the Haplomi by Boulenger, viz. the Percopsidæ (which I have united with the Aphredoderidæ to form the isolated order Salmopercæ), the Stephanoberycidæ (provisionally placed with the Melamphaidæ in an order Xenoberyces, apparently related to the Berycomorphi), the Scopelidæ, Alepidosauridæ, Cetomimidæ, and Chirothricidæ, which with the Ateleopidæ form the order Iniomi, an offshoot from very primitive isospondylous fishes.

The Kneriidæ have already been removed to the Isospondyli by Boulenger (Cat. African Freshwater Fish.); this family is not very remote from the Chanidæ.

* Ann. & Mag. Nat. Hist. (8) iii. 1909, p. 82.

There remain, then, for consideration only the Esocidæ, Umbridæ, and Dalliidæ, the Haplomi *sensu strictu*, and the Cyprinodontidæ and Amblyopsidæ, for which I have proposed the ordinal name Microcyprini.

These two groups resemble each other in the absence of a mesocoracoid and an orbitosphenoid, the separation of the parietals by the supraoccipital, &c., but they differ widely in other respects, and do not seem to be closely related.

The Haplomi are physostomous, the maxillary enters the gape, the mesethmoid is represented by a pair of dermal bones, and the ribs are borne on autogenous parapophyses *. The Microcyprini appear to be physoclistic, the mouth is bordered above by the præmaxillaries only, the mesethmoid is unpaired, and all or most of the ribs are inserted on strong transverse processes. Whereas the Haplomi show relationship to the most generalized isospondylous fishes, the Microcyprini bear more resemblance to the Salmopercæ and Synentognathi, especially the latter.

Order MICROCYPRINI.

Malacopterous physoclists with abdominal pelvic fins, each of 6 or fewer rays. No lateral line. Mouth terminal, bordered above by the præmaxillaries; second, third, and fourth upper pharyngeals dentigerous; lower pharyngeals either separate, or if united with the median suture persistent; branchiostegals 6 or less. Parietals separated by supraoccipital; mesethmoid unpaired; no orbitosphenoid; alisphenoids well separated; basisphenoid, when present, small, free superiorly; roof of myodome membranous or thinly ossified; a short occipital, but no parietal crests. Pectoral arch attached to skull; post-temporal forked, or the lower limb sometimes ligamentous; supra-cleithrum small; no mesocoracoid; radials 4, short and broad, 2 or 3 on hypercoracoid. Vertebral column of solid centra which are co-ossified with the arches; all or most of the præcaudals with strong parapophyses bearing the ribs; epipleurals, but no epineurals; ribs commencing on second vertebra; no upturned centra at base of caudal fin; hypurals ankylosed with the last centrum.

I have examined a number of genera, and I believe that all are physoclistic, but I have not undertaken the detailed research necessary to establish this. Valenciennes came to

* *Cf.* Starks, Biol. Bull. vii. 1904, p. 254, and Zool. Jahrb. 1904, p. 249.

the same conclusion in the case of *Pœcilia* and *Anableps* (Hist. Nat. Poiss. xviii. 1846, pp. 126, 258), and Philippi has recently shown that *Glaridichthys* and *Cnesterodon* are physoclists (Sitzungsb. Gesellsch. naturf. Freund. 1906, p. 232).

Starks has published some notes on the osteology of *Amblyopsis*, *Cyprinodon*, *Fundulus*, and *Pœcilia* (Biol. Bull. vii. 1904).

Suborder 1. Amblyopsoidea.

Mouth rather wide, not protractile; teeth in jaws and on palatines; gill-membranes attached to isthmus; pelvic fins small or absent; vent jugular. Parietals large; opisthotic normal. Palatine distinct from pterygoid; metapterygoid present. No post-cleithrum. Præcaudal vertebræ with parapophyses from the fourth; first two ribs sessile.

Family **Amblyopsidæ**.

This family includes *Chologaster* and the blind cave-fishes *Amblyopsis* and *Typhlichthys* (*cf.* Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 702). I am able to confirm Stark's account of the skeleton of *Amblyopsis* (Biol. Bull. vii. 1904, p. 261), except for the statement that all the præcaudal vertebræ have parapophyses. Eigenmann has studied the degeneration of the eyes in the blind cave-fishes ('Cave Vertebrates of America': Washington, 1909).

Suborder 2. Pœcilioidea.

Mouth small, unless the jaws are produced; præmaxillaries usually protractile; maxillary little movable, adnate to præorbital; teeth in jaws and sometimes on vomer, never on palatines; gill-membranes free from isthmus; pelvic fins usually well-developed, 6-rayed, sometimes absent. Parietals, when present, small or moderate; opisthotic, if present, adherent to outer surface of exoccipital. Palatine and pterygoid ankylosed; no metapterygoid. A single laminar post-cleithrum on each side (except in *Anableps*). Præcaudal vertebræ with parapophyses from the first or second; all the ribs on parapophyses.

The fishes of this suborder have usually been regarded as a single family, Cyprinodontidæ or Pœciliidæ; in that case several subfamilies should be recognized.

Family Pœciliidæ.

Synopsis of the Subfamilies.

I. Exoccipital condyles present; anal fin of both sexes similar in position.

A. Oviparous; anal fin of both sexes similar in structure *.

1. Teeth tricuspid; parietals absent ..... 1. *Cyprinodontinæ*.

2. Teeth conical or villiform.

Parietals present; pelvic fins present; epipleurals simple ..... 2. *Fundulinæ*.

Parietals absent; pelvic fins absent; epipleurals bifurcate or trifurcate ..... 3. *Orestiinæ*.

B. Viviparous; anal fin of male with the first 5 or 6 rays short, stiff and subequal, separated by a shallow notch from the rest of the fin ..... 4. *Characodontinæ*.

C. Viviparous; anal fin of male modified into an intromittent organ, the rays of the fin supporting the tubular prolongation of the urogenital duct.

Eyes normal; intromittent organ naked; skull normal; vertebræ 31 ..... 5. *Jenynsiinæ*.

Eyes divided transversely; intromittent organ scaly; skull very depressed; vertebræ 46 to 53..... 6. *Anablepinæ*.

II. Exoccipital condyles absent; viviparous; anal fin of male advanced and some of its anterior rays enlarged and produced. 7. *Pœciliinæ*.

1. *Cyprinodontinæ*.

Differ from the Fundulinæ only in the tricuspid teeth and the absence of parietals. Vertebræ 26 (in *Lebias dispar*).

Cyprinodon and *Jordanella* from North America; *Lebias* and *Tellia* from Africa and Southern Europe. Some of the species are marine. The Miocene *Pachylebias*, A. S. Woodward, may be placed here.

2. *Fundulinæ*.

Oviparous. Teeth conical or villiform. Parietals present. Exoccipital condyles well developed. Epipleurals simple.

The most generalized and the most widely distributed group of the Pœcilioids. None differs much from *Goodea* in osteology, but *Lamprichthys* retains the basisphenoid, as in the Cyprinodontinæ.

The vertebræ number 28 to 41 (28 in *Haplochilichthys*,

* Except in some species of *Fundulus* in which the oviduct is produced on the anal fin.

29 in *Panchax*, 32 or 33 in *Fundulus*, 34 in *Rivulus*, 41 in *Lamprichthys*).

The South-American genera of this subfamily are *Rivulus* and *Cynolebias*. The North-American species are numerous; many are marine, and most of them appear to be congeneric with *Fundulus heteroclitus*; *Lucania* and probably *Empetrichthys* are related genera. With the exception of the problematical *Fundulichthys virescens*, the Asiatic species fall into two groups; in both the short dorsal fin is placed above the posterior end of the rather long anal, but they differ widely in other respects. In the one the præmaxillaries are flattish and somewhat produced, protractile, the cleft of the mouth is rather wide, horizontal, almost semicircular, the teeth are in bands, with an outer and a more or less distinct inner series of enlarged teeth, vomerine teeth and pseudobranchiæ are present, the gill-membranes are not united, and the pectoral fins are placed low. In the other the mouth is small, transverse, not protractile, with the teeth in a single series, sometimes followed by a second series of minute teeth; there are no vomerine teeth or pseudobranchiæ, the gill-membranes are broadly united, and the pectoral fins are placed high. McClelland, in 1839, included one species of each group in his genus *Aplocheilus* (*Haplochilus*). Valenciennes, in 1846, gave the name *Panchax* to the first of these groups, and Bleeker afterwards definitely restricted *Haplochilus* to the second. *Oryzias*, Jord. & Snyder, is a synonym of *Haplochilus*.

Most of the African fishes which have been referred to *Haplochilus* belong to one or the other of two rather distinct types; a number of species may be placed in *Panchax*, since they differ from the Asiatic species of that genus only in the less produced præmaxillaries; *H. playfairii*, *sexfasciatus*, *fasciatus*, *senegalensis*, *chaperi*, &c. are species of *Panchax*. Several species which have been placed in *Haplochilus* appear to be congeneric with *Haplochilichthys spilauchen*; in these pseudobranchiæ and vomerine teeth are always absent, but they are not invariably present in *Panchax*. *Haplochilichthys* resembles *Haplochilus* and differs from *Panchax* in the high position of the pectoral fins and the united gill-membranes, but has the mouth protractile and the teeth in bands, the outer series enlarged; *H. macrurus*, *johnstonii*, *antinorii*, *myoposæ*, &c. are species of this genus. *Procatopus* is closely related to *Haplochilichthys*. Most of the African species which have been placed in *Fundulus* appear to belong to the genus *Nothobranchius*, which differs from *Panchax* in having the dorsal fin as long as the anal.

I here propose the new generic name *Lamprichthys* for *Haplochilus tanganicanus*, Boulenger, a silvery fish which differs from *Haplochilichthys* in the strongly compressed body, the very long anal fin, and the more numerous vertebræ (41 instead of 28).

The Oligocene and Miocene *Prolebias*, Sauv., seems to be related to *Fundulus*; it has 32 to 34 vertebræ (A. S. Woodward, Cat. Foss. Fish. iv. p. 290, 1901).

3. *Orestiinæ.*

The remarkable genus *Orestias* includes about twelve species from elevated lakes in the Andes of Peru, Bolivia, and Chile. Externally it differs from *Fundulus* chiefly in the absence of pelvic fins, but the absence of parietals and the forked epipleurals are differences of considerable importance. Vertebræ (in *O. pentlandii*) 36. Pellegrin has given an interesting account of these fishes ('Lacs des Haut Plateaux de l'Amérique du Sud,' 1907; also in C. R. Acad. des Sciences, 1904, and Bull. Soc. Zool. xxix. 1904, p. 90).

4. *Characodontinæ.*

Differ from the Fundulinæ especially in that they are viviparous; the anal fin of the male has the first 5 or 6 rays short, stiff and subequal, separated by a more or less distinct notch from the rest of the fin. Vertebræ rather numerous (38 in *Zoogoneticus robustus*, 44 in *Goodea atripinnis*). Four genera, *Zoogoneticus*, *Goodea*, *Girardinichthys*, *Characodon*, with seventeen species, almost peculiar to the system of the Rio Lerma in Mexico.

Zoogoneticus has the jaws and teeth of a *Fundulus*, but *Characodon* and *Girardinichthys* connect it with *Goodea*, in which the mouth is small, the teeth are movable, compressed, and bicuspid, and the rami of the lower jaw are loosely connected (*cf.* Regan, Biologia Centr.-Am., Pisces, pp. xviii and 85).

5. *Jenynsiinæ.*

Jenynsia, with three or four species from the La Plata and Argentina, has the osteological characters of the Fundulinæ, but it has tricuspid teeth and is viviparous; the male intromittent organ is so similar to that of *Anableps* that it can hardly have been independently evolved in the two genera. As noted by Garman, the males of *Jenynsia* are "rights and lefts," *i. e.* the intromittent organ is more easily

moved to one side than the other, is usually somewhat curved towards that side, and is otherwise not quite symmetrical; the urogenital orifice of the female appears to be median and symmetrical.

6. *Anablepinæ.*

The remarkable genus *Anableps*, with three species from Central and South America, shows relationship to *Jenynsia* in the structure of the intromittent organ, but has a number of other characters which are unique in the suborder. The eyes are divided transversely into an upper and a lower portion, the former raised above the surface of the head and adapted for vision in the air. The skull is flat, so depressed that in the orbital region the broad parasphenoid and the frontals are separated by a scarcely perceptible interspace; the frontals are raised above the orbits; there are no post-cleithra and the pelvic bones are well separated; the vertebræ are numerous (46 to 53), the præcaudals with strong parapophyses which are grooved superiorly and have the ribs attached near their distal extremities.

Garman's account of this genus ('The Cyprinodonts,' pp. 70–79, pls. vi. & vii.) is of considerable interest; he has shown that both males and females are "rights and lefts;" in *Anableps anableps* the female urogenital orifice is covered by an enlarged scale, unattached on one side or the other, so as to open to the right or left; presumably dextral males pair with sinistral females, and *vice versâ*.

7. *Pœciliinæ.*

The fishes of this subfamily differ from all the others of the order in the absence of exoccipital condyles. They are viviparous, and in the males the anal fin is advanced and modified, some of the anterior rays being enlarged and produced. Eigenmann has studied the structure of this intromittent organ in the Pœciliids of the La Plata (Proc. U.S. Nat. Mus. xxxii. 1907, p. 425); he has found that it is the third, fourth, and fifth rays which are prolonged; these rays may be rolled up to form a tube, or they may be armed with recurved hooks or with terminal finger-like or antler-like processes. The anal fin of the male is supported by special bony stays, 2 to 5 in number, which project downwards and forwards from the bridges connecting the parapophyses of some of the posterior præcaudal vertebræ (*cf.* Garman, 'The Cyprinodonts,' pl. viii.).

The osteology is much as in the Fundulinæ, except for

the characters noted above; parietals are present, but there is no basisphenoid. Vertebræ 30 to 36 (*Gambusia* 32, *Belonesox* 36, *Pœcilia*, *Mollienisia*, and *Xiphophorus* 30 or 31).

The principal genera are *Belonesox*, *Gambusia*, *Petalosoma*, *Glaridichthys*, *Cnesterodon*, *Heterandria*, *Pœcilia*, *Girardinus*, *Acanthophacelus*, *Phalloptychus*, *Phalloceros*.

In *Belonesox* the jaws are produced and the teeth cardiform; some of the others are carnivorous and have the mouth and dentition of a *Fundulus*, but these are closely related to those mud-eating forms which have a small transverse mouth, movable compressed teeth, and the rami of the lower jaw loosely connected. All the species are American, ranging on the coasts and in the rivers from the southern United States to the La Plata, and especially abounding in Central America and the West Indies. The males of some of the species are among the smallest known fishes.

EXPLANATION OF PLATE VIII.

Goodea atripinnis.

Fig. 1. Hyopalatine and opercular bones (internal view). *pal*, palatine; *q*, quadrate; *ms*, mesopterygoid; *hm*, hyomandibular; *sy*, symplectic; *op*, operculum; *sop*, suboperculum; *iop*, interoperculum.

Fig. 2. Pectoral arch (except post-temporal and supra-cleithrum). *cl*, cleithrum; *pcl*, post-cleithrum; *sc*, hypercoracoid; *cor*, hypocoracoid; *r*, radials.

Figs. 3–5. Skull: 3, from behind; 4, from above; 5, from below. *soc*, supraoccipital; *boc*, basioccipital; *eoc*, exoccipital; *epo*, epiotic; *opo*, opisthotic; *spo*, sphenotic; *pto*, pterotic; *pro*, pro-otic; *asp*, alisphenoid; *psp*, parasphenoid; *v*, vomer; *eth*, mesethmoid; *leth*, lateral ethmoid; *n*, nasal; *por*, præorbital; *f*, frontal; *p*, parietal; *ptt*, post-temporal.

XXXVI.—*The Classification of the Teleostean Fishes of the Order Synentognathi.* By C. Tate Regan, M.A.

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[Plate IX.]

The order Synentognathi (Pharyngognathi malacopterygii of Johannes Müller) may be shortly diagnosed as comprising malacopterous physoclists with the lower pharyngeals completely united. In these fishes the dorsal fin is placed far back, above the anal, the branched rays of the caudal are only 13 in number, the pectorals are placed high, and the

pelvic fins are abdominal, 6-rayed. The scales are thin and cycloid, and the lateral line runs very low. The præmaxillaries are non-protractile and the maxillaries enter the border of the mouth to a greater or less extent; the lower jaw includes a sesamoid articulare, composed of a laminar portion adherent to the inner face of the articulare, and of a rather stout process which projects above the edge of the jaw; the hyo-palatine and opercular bones are normally developed; the branchiostegals number from 9 to 15; the more or less enlarged third upper pharyngeals are dentigerous, opposed to the united lower pharyngeals; the fourth are small or absent; the upper surface of the cranium is flattish, without crests; the nasals are superior in position, firmly united to the frontals and ethmoid; the upper edge of the large præorbital is attached to the outer edge of the nasal, at right angles to the latter; the parietals, when present, are very small, separated by the supraoccipital; there is no orbitosphenoid; the well-separated alisphenoids are not always recognizable as distinct elements; a basisphenoid is present and the myodome has an osseous roof; the opisthotic is absent, and the epiotic and pterotic are produced backwards into a laminar expansion, with which a similar projection of the exoccipital is usually united. The post-temporal is usually simple, attached to the epiotic and pterotic lamina, but there may be a very small inner fork joining the exoccipital; the supra-cleithrum is reduced; the short pectoral radials are rigidly united with the hypercoracoid and hypocoracoid, and the latter is expanded; there is no mesocoracoid. The vertebræ are numerous, the centra and arches are ankylosed, and the ribs and epipleurals are inserted together on the transvere processes, the ribs commencing on the third vertebra; the hypurals are reduced in number and ankylosed with the last centrum, which bears a prominent horizontal ridge on each side.

The Synentognathi are an isolated group, without evident close relationship to any other fishes, but showing certain resemblances to the Microcyprini. The large number of branchiostegals, the absence of spinous fin-rays, the truly abdominal pelvic fins, the mouth-structure, and other characters indicate their derivation from malacopterous physostomes; they do not appear to be even remotely allied to the Percesoces, which I am now disposed to unite with the Percomorphi, for I cannot believe that two groups so precisely similar in their anatomy are not closely related, nor that they have independently acquired the combination of a spinous dorsal, 3 anal spines, 15 branched caudal rays, pelvic fins anterior, of a spine and 5 soft rays, and 24 vertebræ.

The fishes of this order have often been considered to form but a single family, Scombresocidæ (Günth. Cat. Fish. vi. p. 234; Bouleng. Camb. Nat. Hist. Fish. p. 637). In 1878 Cope (Proc. Amer. Phil. Soc. xvii. p. 695) proposed to place *Belone* in a separate family, the possession of a coronoid bone and of zygapophyses being said to distinguish it from the Exocœtidæ. In 1895 (Proc. U.S. Nat. Mus. xviii. p. 167) Dr. Gill put forward the following scheme:—

Family Exocœtidæ.

Synentognathi with the supramaxillaries [maxillaries] only in contact with the intermaxillaries [præmaxillaries], the mandible with a reduced intradentary bone, the hypopharyngeals united in a broad triangular body, the third pair of epipharyngeals much enlarged, those of the fourth pair aborted or united with the third, and the vertebræ without zygapophysoid processes.

Subfamily Scomberesocinæ.

Exocœtids with both jaws more or less elongated and attenuated forward, pectoral fins moderate, and the epipharyngeals of the third pair separate.

Subfamily Exocœtinæ.

Exocœtids with both jaws rounded or simply angulated forward, pectoral fins enlarged and adapted for sustentation of the body in the air, and the epipharyngeals of the third pair separate.

Subfamily Hemirhamphinæ.

Exocœtids with the upper jaw angulate and the lower produced into an elongated beak, pectoral fins moderate or little enlarged, and the epipharyngeals of the third pair closely united in a transverse plate.

Family Esocidæ* [Belonidæ].

Synentognathi with the supramaxillaries united by suture with the intermaxillaries, the mandible with an elongated intradentary bone, the hypopharyngeals united in a narrow body, the third pair of epipharyngeals little enlarged, those of the fourth pair distinct from the third and from each other and the vertebræ with distinct zygapophysoid processes.

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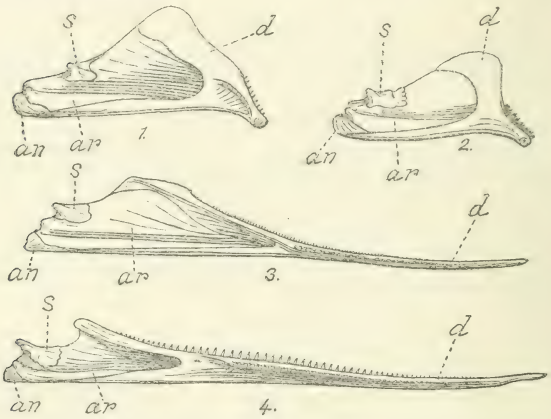
* There can be no question that Artedi and Linnæus regarded the pike, *Esox lucius*, as the type of the genus *Esox*. Linnæus, in the sixth edition of the 'Systema Naturæ,' included three species in the genus—1. *lucius*, 2. *belone*, 3. *acus*; and in the 'Fauna Suecica' two—1. *lucius*, 2. *belone*. Artedi, in the 'Bibliotheca Ichthyologica' (1738), also placed the pike, *Esox rostro plagioplateo*, as the first species of the genus *Esox*, and as the first synonym gave *Esox*, Pliny. Thus, by the rule of tautonymy, *E. lucius* is the type of *Esox*, and Rafinesque's restriction of the name to *E. belone* may be ignored. The fact that in all probability Artedi was mistaken in thinking that Pliny's *Esox* was the pike has no importance in this connexion.

This classification was adopted by Jordan and Evermann (Bull. U.S. Nat. Mus. xlvii. 1896, p. 707) except that the subfamilies were given family rank. The diagnostic characters were practically unchanged, except that the position and size of the additional bone in the lower jaw were correctly indicated. Ridewood (P. Z. S. 1904, ii. p. 72) has pointed out that the names "addentary" and "intradentary" proposed by Gill were based on a misconception; the best name for this bone is that given by Ridewood, namely "sesamoid articulare." The development of this bone is more or less proportional to the length of the jaw and the strength of the dentition; it is largest in *Tylosurus* and smallest in *Exocœtus* (*cf.* text-fig.). None of the characters used by Gill to characterize his two families is really distinctive. In *Scombresox*



Inner view of left ramus of lower jaw of: 1. *Exocœtus arcticeps.* 2. *Chriodorus atherinoides.* 3. *Scombresox saurus.* 4. *Belone belone.*

s, sesamoid articulare; *ar*, articulare; *an*, angulare; *d*, dentary.

the form of the maxillary and its mode of attachment to the præmaxillary are exactly as in the Belonidæ, and the pharyngeal bones and teeth are much more similar to those of *Belone* and *Tylosurus* than to those of *Hemirhamphus* or *Exocœtus* (*cf.* Pl. IX.). Zygapophyses are equally well developed in all the Synentognaths; throughout the group the neural arch of each vertebra has on each side a posterior

projection fitting an emargination of an anterior laminar expansion of the neural arch behind it; in the posterior caudal region the hæmal arches articulate in a somewhat similar manner, but on the anterior caudal and posterior præcaudal vertebræ the posterior processes are longer and directed vertically downward.

I find that the structure of the jaws, the pharyngeal bones and teeth, the skull, the pectoral arch, and the pelvic bones call for the recognition of two very distinct suborders, each including two closely related families.

Order SYNENTOGNATHI.

Suborder 1. Scombresocoidea.

Synentognaths with small scales and with the mouth typically large, the jaws usually produced and narrowed forwards; rami of the lower jaw united by the interlocking of a series of inner processes (except in *Cololabis*); maxillaries firmly united to præmaxillaries. Third upper pharyngeals moderately enlarged, separate; fourth usually present; lower pharyngeal triangular or long and narrow. Pharyngeal teeth usually villiform or granular, some of the teeth of the principal plates often compressed, tricuspid. Parasphenoid without apophysis; myodome elongate, the parasphenoid and pro-otic meeting in a long sutural union; auditory bulla, if distinct, little prominent, with but a shallow depression in front of it. Post-temporal more or less expanded and laminar, simple or with a small inner fork; supracleithrum small, partly or entirely hidden by the post-temporal; cleithrum connected with basioccipital by a strong ligament. Each pelvic bone of an anterior subtriangular lamina and an erect laminar process, which is more or less expanded superiorly.

Family 1. Belonidæ.

Post-temporal forked, the upper fork more or less expanded, anteriorly attached to the nearly horizontal epiotic and pterotic lamina, the lower fork short and slender, attached to a process of the exoccipital lamina; supracleithrum small, vertical, more or less concealed beneath the post-temporal. Vertebræ 57 to 77 (57 in *Xenentodon**, 74 in *Potamorrhaphis*, 77 in *Belone*); præcaudals with strong

* 57 also in the Miocene *Belone tenuis* (Kramberger, Glasnik Soc. Hist. Nat. Croatia, x. 1898, p. 26, pl. ii. fig. 1).

parapophyses to which the ribs are attached. Both jaws strongly produced, furnished with bands of small teeth and with a single series of more or less strongly enlarged, erect, conical, pointed teeth. No finlets.

Synopsis of the Genera.

I. Gill-rakers developed; jaws comparatively slender; enlarged teeth of upper jaw moderate, of lower comparatively small and close-set; lower pharyngeal triangular; second and third upper pharyngeals dentigerous; fourth usually distinct, dentigerous.

Body scarcely or moderately compressed. 1. *Belone*, Cuv., 1817 *.
Body very strongly compressed ..... 2. *Petalichthys*, Regan, 1904.

II. Gill-rakers absent or vestigial; jaws comparatively stout; enlarged teeth of both jaws strong, spaced canines.

A. Dorsal rays subequal; lower pharyngeal triangular; second, third, and fourth upper pharyngeals separate, dentigerous.
3. *Potamorrhaphis*, Günth., [1866.

B. Anterior dorsal rays forming a lobe; lower pharyngeal elongate, narrow, the dentigerous plate scarcely expanded posteriorly; second and third upper pharyngeals dentigerous; fourth usually distinct, dentigerous.

Body scarcely or moderately compressed. 4. *Tylosurus*, Cocco, 1829.
Body strongly compressed ..... 5. *Athlennes*, Jord., 1886.

C. Anterior dorsal rays forming a lobe; lower pharyngeal small, narrow, pointed or rounded at both ends; only one pair of dentigerous upper pharyngeals, the third.
6. *Xenentodon*, gen. nov.

I have examined the pharyngeal dentition in the following species:—*Belone belone*, Linn., *acus*, Risso, *trachura*, Cuv. & Val., *platura*, Benn., *gracilis*, Lowe; *Petalichthys capensis*, Regan; *Tylosurus acus*, Lacep., *marinus*, Walb., *annulatus*, Cuv. & Val., *robustus*, Günth., *caudimaculatus*, Cuv., *strongylurus*, Bleek., *anastomella*, Cuv. & Val.; *Athlennes hians*, Cuv. & Val.; *Xenentodon cancila*, Buch. Ham., *canciloides*, Bleek.

The lower pharyngeal plate of *Xenentodon* seems to be derived from that of *Tylosurus* by the constriction off of the anterior part and disappearance of the remainder.

* According to the synonymy given by Dr. Gill, *Raphistoma*, Rafinesque, 1815, has priority over *Belone*, Cuv., 1817. Rafinesque ('Analyse de la Nature,' p. 89) placed *Raphistoma* after *Esox* in the subfamily Esoxidia ("Une seule nageoire dorsale; dos non aguillonné") of the family Siagonia ("Machoires très-prolongées, dentées") of the order Gastripia ("Les abdominaux"). The only generic diagnosis is a reference to *Belone*, Gr. [Gronovius]. As the name *Belone* apparently does not occur in the writings of Gronovius, *Raphistoma* may be regarded as a *nomen nudum*.

Family 2. Scombresocidæ.

Post-temporal simple, a broad lamina anteriorly overlapping the nearly vertical epiotic and pterotic lamina; supra-cleithrum a small bone adherent to the inner face of the post-temporal at its posterior edge. Vertebræ 65–70 *, parapophyses mostly very short, with the ribs nearly sessile. Jaws more or less produced and attenuated forwards; teeth very small. Posterior rays of dorsal and anal detached finlets.

Two genera, *Scombresox*, Lacep., and *Cololabis*, Gill. In both the pharyngeal bones and teeth are much as in *Belone*; the third upper pharyngeals are moderately large, separate, and are followed by the very small fourth pair, which bear a few teeth; the lower pharyngeals form a moderately broad triangular plate. In *Scombresox* the structure of the jaws is exactly as in the Belonidæ, even to the presence of the interlocking processes which unite the produced portions of the rami of the lower jaw; the absence of these anterior extensions in *Cololabis* may be regarded as probably secondary.

Suborder 2. Exocœtoidea.

Synentognaths with rather large scales and small mouth. Second and third upper pharyngeals dentigerous, the third pair strongly enlarged, together forming a somewhat convex ovoid plate; fourth upper pharyngeals absent; lower pharyngeal broad, triangular, with concave upper surface; teeth on principal pharyngeal plates anteriorly villiform, posteriorly incisors with transversely expanded horizontal edge, the two types connected by teeth of intermediate form, many of which are tricuspid. Parasphenoid with an inferior apophysis in front of the upper pharyngeals; myodome short, a deep depression between its outer wall and the prominent compressed auditory bulla. Post-temporal and supra-cleithrum simple, slender, curved, the former attached along the posterior edge of the pterotic lamina; supra-cleithrum suspended from the posterior end of the post-temporal; cleithrum curved inwards above, articulating directly with basioccipital. Each pelvic bone of an anterior subtriangular lamina and an erect slender process.

* 65 in *Scombresox saurus*; 70 in the Miocene *Scombresox acutirostris* (Sauvage, Ann. Sci. Géol. iv. 1873, no. 1, fig. 68, and xi. 1880, no. 3, p. 48).

Family 1. Hemirhamphidæ.

Præmaxillaries anteriorly forming a flat triangular expansion; maxillaries firmly united to præmaxillaries; teeth in jaws small, compressed, usually tricuspid; third upper pharyngeals ankylosed. Vertebræ 49 to 55; parapophyses strong, nearly horizontal. Pectoral fins short or moderately long.

Genera: *Cobitopsis* (probably including *Chriodorus*), *Arrhamphus*, *Hemirhamphus*, *Hemirhamphodon*, *Zenarchopterus*, *Dermatogenys*, *Oxyporhamphus*, *Euleptorhamphus*.

Hemirhamphus occurs in the Upper Eocene of Monte Bolca.

Cobitopsis acutus, from the Lower Miocene of France, is very closely related to *Chriodorus atherinoides* from the coast of Florida. Dr. Smith Woodward has permitted me to examine examples of the extinct species, which I have compared with specimens of *C. atherinoides*. The two agree in almost every detail; the form, position, and structure of the fins and the number of rays are exactly the same: the jaws, opercles, pectoral arch, &c. are extremely similar in the two species, and the number of vertebræ is nearly or quite identical. In an example of *Chriodorus atherinoides* I count 16 dorsal, 17 anal, 12 pectoral, 6 pelvic, and 13 branched caudal rays, and I find these numbers also in *Cobitopsis acutus*; I find 49 vertebræ in *C. atherinoides*, and approximately this number in *C. acutus*.

In making a restoration of the extinct species Dr. Smith Woodward* has evidently been influenced by Mr. Boulenger's opinion that this fish was related to *Ammodytes*. The broad cleithrum of the Hemirhamphidæ is represented as the enlarged suboperculum of the Ammodytidæ, and the pectorals are shown as symmetrical and placed low, whereas they appear to me to be asymmetrical and placed high. *C. acutus* has usually been described as toothless, but I believe that I can recognize traces of small teeth in the jaws of one of the specimens.

In *C. acutus* the head is longer than in *C. atherinoides*, measuring more than $\frac{1}{4}$ of the length of the fish to the base of the caudal, the lower jaw seems to be longer, more than $\frac{1}{3}$ the length of the head, and the snout is apparently more produced.

* Cat. Fossil Fish. iv. p. 355 (1901).

Family 2. **Exocœtidæ.**

Præmaxillaries with straight transverse anterior margin; maxillaries free from or merely adherent to præmaxillaries; teeth in jaws minute, villiform; third upper pharyngeals simply coalescent, the plate readily separating into its two components. Vertebræ 44 to 52; most of the parapophyses directed somewhat downwards and forwards. Pectoral fins large.

Genera: *Exocœtus, Halocypselus, Parexocœtus, Fodiator.*

EXPLANATION OF PLATE IX.

Dentigerous pharyngeal bones of: A. *Exocœtus lineatus*; B. *Hemirhamphus intermedius*; C. *Xenentodon cancila*; D. *Tylosurus acus*; E. *Belone belone*; F. *Scombresox saurus.* The second, third, and fourth upper pharyngeals are numbered.

XXXVII.—*Note on Parasitic Castration in the Earthworm* Lumbricus herculeus. By Igerna B. J. Sollas, B.Sc., Newnham College, Cambridge.

All observations on parasitic castration have acquired fresh interest since the publication of Mr. Geoffrey Smith's work on the experimental analysis of sex (3). Also, so far as I know, no case of parasitic castration of a hermaphrodite animal is at present on record.

The castration described in this note attracted my attention in February 1910, when I found that of ten full-sized earthworms provided for demonstration purposes five possessed either no clitellum or an imperfectly developed clitellum, and in the abnormal individuals the seminal vesicles were either small and contained no sperm at any stage of development, or they were more or less normal as to size, but contained chiefly immature stages of sperm-cells. The spermathecæ were empty; the ovaries were normal. In those worms in which the degeneration of the seminal vesicles was most complete not only was there no trace of clitellum, but the lips of the male duct were not tumid and the genital chætæ were not more prominent than the rest. Further batches of worms were obtained from the same locality, and rather less than half their number proved to lack the clitellum. A number of specimens without clitellum have also been found in various other localities.

Microscopical examination showed that the cause of the abnormality lay in a bacterial infection, not only the cytophores but the spermatocytes themselves being crowded with minute spherical bacteria in active movement. The contents of the seminal vesicles of some of those individuals (from the same plot of ground) which possessed a clitellum were also not entirely normal, a certain proportion of the sperm mother-cells containing the bacteria.

The greater number of the bacteria are spherical, measuring about ·0014 mm. in diameter; others are elongated, measuring ·007 by ·0014 mm. Sometimes distinctly larger individuals occur, measuring ·0035 by ·0043 mm.

In all the infected worms the seminal vesicles contained unusually large numbers of *Monocystis*—spores, cysts, and free swimming individuals, but not the attached form.

In all cases the amœbocytes were conspicuous in the seminal vesicles, and were crowded with ingested and now motionless individuals of the bacterium in question. In this connexion Brasil's remarks are interesting (1) :—" La présence d'amibocytes nombreux dans les vésicules séminales des *Lumbricus* est normale et connue. Les amibocytes seraient attirés dans ces organes, a-t-on dit, par les parasites qui y abondent presque toujours (Grégarines du genre *Monocystis*) et contribueraient par leurs propriétés phagocytaires à prévenir un encombrement qui, s'il n'était entravé, aboutirait fatalement à la castration tout au moins partielle de l'hôte." Brasil, however, thinks that the amœbocytes have another and more general function :—" Le rôle principale des amibocytes des vésicules séminales consisterait dans le nettoyage complet de ces organes après les émissions spermatiques. . . . L'action sur les parasites ne serait qu'un épisode particulier de cette fonction plus générale."

I have never observed this asserted resorption of the reproductive elements by the phagocytes: in those instances in which I have found the seminal vesicles of the earthworm containing only amœbocytes charged with granules, as Brasil describes, the condition has been brought about by the bacterial destruction of the spermatic elements.

This bacterium is probably as constant an occupant of the seminal vesicles of the earthworm as is *Monocystis*. I have found it in small numbers in healthy worms obtained from various places. In a healthy worm, however, the majority of the bacteria are ingested by the amœbocytes and are consequently motionless; often great crowds of bacteria are seen in the amœbocytes, while living individuals are only found by searching. Their inconspicuousness when motion-

less no doubt accounts for their having so long escaped notice. That they are a serious and constant enemy of the earthworm seems to be shown by the comparative frequency with which worms devoid of clitellum and normal sperm occur, and also by observations upon earthworms found travelling over the surface of paths after rain. These are stated by Latter (2) to be "in the majority of cases infected by larvæ of parasitic flies and doomed to die." All the specimens that I have examined have contained large numbers of bacteria in the seminal vesicles and no ripe sperm. It may be that some of them were also infected by fly larvæ; but, even if so, my observations show that when conditions are otherwise unfavourable the bacterium is always ready to take advantage.

Literature referred to.

(1) Brasil, L.—C. R. Ac. Sci. xl. pt. 9, 1905, p. 597.
(2) Latter, O.—'The Natural History of some Common Animals,' 1904, p. 3.
(3) Smith, G.—Quart. J. Microsc. Sci. liv. 1910, p. 577.

XXXVIII.—*On a new Marsupial.* By Prof. F. Foerster and the Hon. Walter Rothschild, Ph.D.

Phalanger larvatus, sp. n.

Fur of pelage velvety, smoky grey, an ill-defined mesial dorsal line or stripe of dark brown expanding into a distinct smoky black band over head and face to the nose. Throat black, a black band from throat across cheeks to ears, a similar one on crown between the ears. Snout smoky black; face tawny ochraceous. Forearms washed with tawny ochraceous on outside. Underside dirty grey, paler in centre; chest and lower throat yellowish white. Tail hairy to tip, black, with a few scattered silky grey hairs at base; underside of tail naked for the apical 120 mm. Ears hairy outside, tawny ochraceous, naked within. Upper dental series, distance between *c* and *i* 3 = to that between *c* and *pm* 1.

Nearest to *avarus*, Thom. *P. larvatus* as well as *P. avarus*, Thom., can always be distinguished from the forms of *P. canescens* by the tawny outside of the ears; from *P. avarus* it is at once distinguished by the entirely black tail.

Dimensions. Head and body 340 mm.; tail 230–250; nose to ear 35; ear 8.

Hab. Rawlinson Mts., German New Guinea. 2 ♂ ♂.

XXXIX.—*Rhynchotal Notes.*—LIV. By W. L. Distant.

Pentatomidæ from various Regions.

Moonta, gen. nov.

Body elongate : head depressed, longer than broad at base, somewhat angularly narrowed and pointed at apex, moderately deeply inserted at base in the pronotum ; eyes prominent, but not reaching the anterior pronotal angles ; antennæ pilose, first joint not reaching apex of head, second joint slightly longer than the third, subequal to fourth ; pronotum not quite twice as broad at base as long, the lateral margins rounded, the anterior angles truncate behind eyes, beyond which they also project, anterior margin deeply excavate for the reception of head, posterior margin truncate, the disk a little convex ; scutellum much longer than broad, almost as long as head and pronotum together, attenuated to apex, which is somewhat flattened and reaching the inner apical angles of the corium ; corium longer than scutellum, apical margin oblique ; membrane small, not passing abdominal apex ; rostrum reaching the intermediate coxæ, the second joint in type apparently angularly raised from base, but this character may be artificial ; tibiæ strongly spinulose.

In general appearance this genus resembles the Oriental genus *Gampsotes*, Sign., from which it is at once distinguished by the shorter rostrum, the narrow pointed head, and the more excavate anterior margin of the pronotum.

Moonta alexandria, sp. n.

Head, pronotum, and scutellum shining black, corium more purplish black, membrane pale ochraceous, subhyaline, darker on basal area ; head practically impunctate, the ocelli red, near eyes and far apart from each other ; pronotum sparsely but distinctly punctate on posterior half, the extreme lateral margins acute ; scutellum (excluding base and apex) very coarsely punctate ; corium thickly finely punctate ; antennæ pitchy brown ; anterior and intermediate legs pitchy brown, posterior legs piceous ; other structural characters as in generic diagnosis.

Long. 6 mm.

Hab. N. Australia ; Alexandria (*W. Stalker*, Brit. Mus.).

GAMBIANA, gen. nov.

Body suboblong; head longer than broad between eyes, lateral lobes a little longer than the central lobe, but not meeting beyond it, the lateral margins distinctly reflexed, rounded at apices, a distinct curved spine a little outwardly directed in front of each eye; antennæ five-jointed, joints 1 to 4 almost subequal in length, basal joint not quite reaching

Gambiana asper, Walk.

apex of head; pronotum about twice as broad at base as long, roundly deflected towards head, lateral margins roundly oblique, lateral angles subprominent, very distinctly toothed, between them a transverse impression, and a central longitudinal ridge which neither reaches the anterior nor the posterior margin, anterior area irregularly sculptured or rugose; scutellum much longer than broad, apparently reaching the abdominal apex (abdomen mutilated in type), strongly sinuate on each side near base, apex broadly truncate, a very distinct central basal rounded fovcation, the margins of which are strongly ridged and continued posteriorly for a short distance on disk; corium exposed on each side for about two-thirds the length of scutellum; rostrum reaching the posterior coxæ; abdomen mutilated.

This genus is founded on, and intended to elucidate, the species described by Walker as *Podops asper*, the condition of the type specimens I considered being too bad for exact determination when I referred to them in 1899 (Ann. & Mag. Nat. Hist. (7) iv. p. 48). They have recently, by the skilled attention of Mr. Ewd. Waterhouse, been thoroughly cleaned and reset, and the accompanying figure has been made by

Mr. Knight. The principal character is found in the extraordinary sculpture of the scutellum, a point not observed by Walker in the badly pinned specimen which formed his type. It seems to be nearest allied to *Oncozygidea*, Reut.

Gambiana asper.

Podops asper, Walk. Cat. Het. i. p. 72 (1867).

Hab. Gambia (Brit. Mus.).

In his excellent treatment of the Graphosomatinæ, Schouteden considered that this species, which he referred to as *aspera*, might prove to be a synonym of *Scotinophora fibulata*, Germ. The present figure and above description will serve to prevent further misconception. The pronotum is more or less ochraceously pilose.

Amberiana, gen. nov.

Head a little longer than the breadth at base between eyes, the lateral margins strongly sinuate, the apical marginal area rounded, central lobe prominent but not distinctly extending beyond the lateral lobes, lateral margins slightly reflexed; eyes laterally prominent; antennæ with the basal joint not reaching apex of head, second joint short, shorter than first, third longer than first and second together, remaining joint or joints mutilated in the specimens now before me; ocelli near base, almost as far from eyes as from each other; pronotum about twice broader at base than medial length, the lateral margins lobately ampliate, not serrate, on anterior half more strongly lobately ampliate and continued considerably beyond but not in front of eyes, the posterior half less ampliate, with the lateral angles subprominent, anterior margin a little concave, posterior margin truncate, the cicatrices prominent and broad, behind them a distinct transverse impression; scutellum short, about as long as broad at base, the disk moderately globose, the lateral margins oblique for about basal two-thirds and then straightly narrowed to apex, which is rounded, a black levigate spot at each basal angle; corium about as long as head and pronotum together, broad, apex broadly angularly rounded; membrane not quite reaching abdominal apex, the veins broadly reticulate; rostrum long, reaching the base of the third abdominal segment in ♀, base of fifth in ♂, first joint reaching base of head, third joint a little longest; mesosternum centrally sulcate; abdomen broadly, centrally, longitudinally sulcate; legs moderately short, anterior femora

very obscurely toothed before apex, tibiæ shorter than the femora and more or less longitudinally sulcate; tarsi two-jointed.

This genus of Halyaria is allied to *Paraleria*, Rent., by the aberrant character of the two-jointed tarsi, but it is at once separated from it by the non-crenulated lateral pronotal margins and the entirely different structure of the same.

Amberiana montana, sp. n.

Ochraceous with black markings; membrane dull greyish, the reticulate venation black; antennæ with the first and second joints ochraceous, the third black, with the apex ochraceous; head with the eyes and two longitudinal streaks at the region of the ocelli, and sometimes the basal margins of the central lobe, black; pronotum with four variable, more or less broken, oblique black fasciate markings; scutellum with the basal angles, two central basal and two central lateral marginal linear spots black; corium with variable and indeterminate black markings; connexivum ochraceous, with large segmental black spots; sublateral margins of sternum, central disk of mesosternum, linear spots to extreme lateral margins of abdomen, spiracles, an incised line behind them, margins of the abdominal segments, and a large spot on apical segment black; rostrum castaneous brown; head, pronotum, scutellum, and corium slightly rugulose and thickly punctate; the black sublateral margins to sternum granulose; other structural characters as in generic diagnosis.

Long., ♂ 8½, ♀ 10 mm.

Hab. Madagascar; Amber Mts. (Brit. Mus.).

Kapunda, gen. nov.

Head about as long as broad at base, the lobes subequal in length, the central lobe above a little prominent, the lateral margins slightly straightly oblique, the apex broadly rounded; antennæ with the first, second, and third joints almost subequal in length, first a little shortest; pronotum twice as broad at base as long, moderately depressed anteriorly and laterally, the lateral margins convex and moderately laminately reflexed, anterior and posterior margins truncate, anterior angles truncate behind eyes, lateral angles rounded, not prominent; scutellum longer than pronotum, broad, narrowed but not attenuated to apex, which is rounded; corium about as long as scutellum, but its apex

slightly passing apex of scutellum; membrane short, not passing apex of abdomen, veins simple, somewhat irregularly cellular on basal area; rostrum reaching the intermediate coxæ, first joint not quite reaching base of head; tibiæ setose and sulcate; posterior tarsi with the first joint shorter than the two apical joints together, the joints robust.

Allied to *Menaccarus*, A. & S., but distinguished from that genus by the first joint of the posterior tarsi being shorter than the two apical joints together.

Kapunda typica, sp. n.

Dull ochraceous, darkly punctate; lateral margins of the pronotum and basal lateral margins of corium pale ochraceous and much more sparsely punctate; scutellum with a small black foveate spot in each basal angle, preceded by a pale ochraceous elongate levigate spot, a black elongate marginal spot on each side before apex, which is narrowly ochraceous and impunctate; membrane pale hyaline; connexivum ochraceous, with large punctate black spots at the apices of the incisures; body beneath ochraceous, head and sternum darkly punctate, the punctures forming more or less distinct dark spots on the lateral areas of pro-, meso-, and metasterna; abdomen beneath with a distinct black longitudinal submarginal fascia on each side; femora more or less spotted with piceous or testaceous; on disk of abdomen beneath a few minute reddish spots; structural characters as in generic diagnosis.

Long. 6 mm.

Hab. New South Wales; Sydney (*Comm. J. J. Walker*, Brit. Mus.).

Neomenestheus, gen. nov.

Head about as long as broad between outer margins of eyes, a little longer than the pronotum, lateral lobes longer than the central, meeting beyond it but cleft at their apices, their lateral margins moderately reflexed; ocelli near base, much nearer eyes than to each other; antennæ five-jointed, third joint about reaching apex of head, first and second subequal in length, third a little shortest, fourth and fifth subequal and longest; pronotum transverse, the lateral margins oblique and narrowly reflexed, anterior and posterior margins subtruncate, lateral angles rounded, not prominent; scutellum about as long as broad at base, only moderately narrowed to apex, which is somewhat broadly rounded; corium about as

long as scutellum, though its apex passes the apex of scutellum, its apical margin roundly oblique; membrane short, not nearly reaching abdominal apex, the veins simple; connexivum exposed from about posterior half of corium; bucculæ elevated, outwardly curved and divergent from middle to base of head; rostrum reaching the posterior coxæ, first joint slightly passing base of head, second longest and reaching the intermediate coxæ; sternum centrally longitudinally impressed; tarsi three-jointed, second joint smallest.

Allied to *Menestheus*, Stal, and *Paramenestheus*, Bredd., from which it principally differs by the scutellum not longer than broad and with its apex broadly rounded.

Neomenestheus walkeri, sp. n.

Ochraceous, somewhat thickly punctate; head with the lateral margins and the margins of the central lobe distinctly darkly punctate; antennæ with the first, second, and third joints ochraceous, the fourth and fifth joints and apex of first black; pronotum thickly coarsely punctate, a small black spot near anterior angles, another near middle and sublateral, a third near the lateral angles; scutellum more distinctly punctate on basal and lateral areas, a small punctate black spot near each basal angle; corium thickly and more finely punctate; membranal veins piceous; connexivum yellowish, with small black spots at the segmental incisures; body beneath and legs ochraceous, finely punctate; apices of tarsi black; structural characters as in generic diagnosis.

Long. 7 mm.

Hab. New South Wales; Sydney (*Comm. J. J. Walker*, Brit. Mus.).

Genus Agonoscelis.

Agonoscelis, Spin. Ess. p. 327 (1837).

Type, *A. nubila*, Fabr.

Agonoscelis antennata, sp. n.

Head ochraceous, coarsely thickly darkly punctate, the lateral lobes slightly outwardly projecting beyond the central lobe, which, being less punctate, is paler in hue; antennæ black, the basal joint more or less, and the remaining joints distinctly, basally pale ochraceous, first joint not reaching apex of head, second, fourth, and fifth longest and subequal in length; pronotum dull obscure ochraceous, somewhat coarsely darkly punctate, anterior lateral margins impunctate

and somewhat longly pilose, the lateral angular areas spotted with black; scutellum ochraceous, somewhat sparingly darkly punctate, the apex broadly pale ochraceous; corium more or less purplish, thickly finely punctate; membrane pale ochraceous, subhyaline, the basal areas reflecting the dark abdomen beneath, somewhat longly passing the abdominal apex; connexivum ochraceous, with large black spots at the apices of the incisures; body beneath and legs pale ochraceous; sternal spots, spiracles, small scattered spots to abdomen beneath, apex of rostrum, apical spots to femora, and tarsi (mostly) black; rostrum about reaching the posterior coxæ.

Long. 11–13 mm.

Hab. Corea; Quelpart Island (*S. Ichikawa*, Brit. Mus.).

Genus Hoplistodera.

Hoplistodera, Westw. in Hope Cat. i. p. 18 (1837).

Type, *H. testacea*, Westw.

Hoplistodera fergussoni, sp. n.

Brownish ochraceous; antennæ with the first joint stoutest, not reaching apex of head, second joint distinctly longer than first, subequal in length to third, remaining joints mutilated in type; head with the central lobe prominent, its apex slightly projecting beyond the lateral lobes, and there it is transversely impressed, lateral lobes and basal area more or less coarsely punctate, on basal area the punctures arranged in three longitudinal fasciate series; pronotum coarsely punctate, moderately levigately rugulose, an indistinct central longitudinal levigate line, the lateral angles distinctly produced, their apices acute and recurved; scutellum coarsely punctate, on apical half more finely and thickly punctate, on basal half somewhat transversely rugulose; corium sparingly finely punctate, more coarsely and thickly punctate on the costal and subcaval areas; membrane pale brownish ochraceous, subhyaline, distinctly passing the abdominal apex; sternum distinctly, abdomen finely punctate; connexivum ochraceous, with a dark spot on each side of the segmental incisures.

Long. $7\frac{1}{2}$ mm.; exp. pronot. angl. $6\frac{1}{2}$ mm.

Hab. China; Mountains 50 miles N.W. of Chengtu (*W. N. Fergusson*, Brit. Mus.).

Genus Axiagastus.

Axiagastus, Dall. List Hem. i. p. 221 (1851).

Type, *A. rosmarus*, Dall.

Axiagastus cambelli, sp. n.

Black; lateral margins and longitudinal lines to head, sublateral margins and suffusions to anterior area of pronotum, basal margin, central lateral margins and apex of scutellum, a spot on posterior disk of corium, antennæ, rostrum, body beneath, and legs ochraceous; transverse fasciæ to sternum and abdomen, two curved longitudinal lines at middle of head beneath, spiracles and a central longitudinal fascia to abdomen, and apex of rostrum black; first joint of antennæ not reaching apex of head, second and third subequal in length, fourth and fifth a little longest and also subequal; spines from bucculæ long, acutely downwardly produced; body above thickly punctate except on the ochraceous markings; connexivum ochraceous, with black spots at the abdominal incisures, and inwardly margined with the same colour; membrane dark bronzy, slightly passing the abdominal apex.

Long. 13 mm.; exp. pronot. angl. 8 mm.

Hab. Solomon Islands (*W. H. Cambell*); Duke of York Island; Aignan Island (Brit. Mus.). On Solomon Islands "destructive to coconuts" (*W. H. Cambell*).

Genus Euryaspis.

Euryaspis, Sign. Ann. Soc. Ent. Fr. (2) ix. p. 342 (1851).

Type, *E. transversalis*, Sign.

Euryaspis flavescens, sp. n.

Flavescent; antennæ reddish testaceous, first joint not reaching apex of head, second a little longer than first, much shorter than third, which is a little longer than either fourth or fifth, these being almost equal in length; head more or less suffused with pale testaceous red, lobes equal in length; pronotum thickly, obscurely, finely punctate, the extreme anterior and lateral margins narrowly palely levigate, the cicatrices near the anterior margin; scutellum and corium thickly, obscurely, finely punctate; rostrum (excluding basal joint) testaceous, reaching intermediate coxæ; sternum finely punctate, abdomen more obscurely finely punctate; abdominal spiracles black; abdomen basally, centrally, spinously tuberculate; metasternum elevated; mesosternal carination somewhat strongly elevated, in front reaching the anterior coxæ, posteriorly ampliated.

Long. 13–14½ mm.

Hab. China; Foo Chow (*C. B. Rickett*, Brit. Mus.). E. Borneo, Moorjawa (*H. D. Jensen*, Brit. Mus.).

This is the largest species of the genus yet described, and is the second known from the Oriental Region.

Genus Utana.

Utana, Dist. Ann. & Mag. Nat. Hist. (7) v. p. 423 (1900).

Type, *U. suprema*, Walk.

Utana albertisi, sp. n.

Head ochraceous, punctured and mottled with shining green, the punctures coarse, central lobe more sparingly punctate; antennæ ochraceous, first joint not reaching apex of head, second longer than first, a little shorter than third; pronotum with the anterior half ochraceous, posterior half dark castaneous, the ochraceous area with a few dark punctures on disk, the antero-lateral and the anterior margins thickly darkly punctate, the posterior dark area finely somewhat thickly punctate, the lateral angles produced, with their apices broad and backwardly recurved; scutellum and corium dark castaneous, the first with the basal disk a little convex and slightly tinged with olivaceous green, distinctly punctate; corium thickly and more finely punctate; membrane cupreous, passing the abdominal apex; body beneath and legs shining ochraceous; two small dark spots on each side of pro-, meso-, and metasterna; legs spotted with castaneous, the apices of the femora broadly of the same colour; rostrum scarcely passing the posterior coxæ; sternal keel extending a little beyond the anterior coxæ, ventral spine moderately short; prosternum coarsely punctate; abdominal spiracles black.

Long. 14½ mm.; exp. pronot. angl. 9½ mm.

Hab. New Guinea; Yule Island (*L. M. D'Albertis*).

Differs from *U. suprema*, Walk., the only other known species of the genus at the present time, by the shorter, less acute, and recurved lateral pronotal angles, and by the sternal keel extending a little beyond the anterior coxæ, and the shorter rostrum; the last two characters render it almost what is by some considered as of a subgeneric position.

Genus Bothrocoris.

Brachystethus, subgen. *Bothrocoris*, Mayr, Reis. Nov., Hem. p. 68 (1866).

Type, *B. quinquedentatus*, Spin.

Bothrocoris consanguineus, sp. n.

Above purplish brown, finely rugulose and thickly punctate; lateral margins of the pronotum, three small spots at basal margin and a spot on each side of apex of scutellum, and basal third of costal lateral margin pale levigate ochraceous; a black impressed spot at each basal angle of scutellum; membrane purplish brown, the apical margin narrowly ochraceous; connexivum ochraceous, with large black spots on each side of the incisures; body beneath purplish brown, finely irrorated with ochraceous and more or less darkly punctate; lateral margins of sternum and abdomen pale levigate ochraceous; spiracles shining black, sublateral margins of abdomen more or less black; legs reddish testaceous; rostrum about reaching the intermediate coxæ; antennæ with the first joint reddish testaceous, remaining joints black, first joint passing apex of head, third, fourth, and fifth joints subequal in length, each longer than second; anterior margins of lateral lobes of head narrowly ochraceous.

Long. 12 mm.

Hab. Paraguay; Sapucay (*W. Foster*, Brit. Mus.).

Closely allied to *B. quinquedentatus*, Spin., but the lateral pronotal margins more straightly oblique, apical markings of the scutellum very different, &c.

Okeanos, gen. nov.

Subelongate; head a little longer than breadth between eyes, lobes of equal length, the lateral lobes obliquely rounded at their apices, ocelli near base and eyes; antennæ five-jointed, first joint almost reaching apex of head, third, fourth, and fifth joints subequal in length, each a little longer than second; pronotum about three times broader between lateral angles than long, moderately declivous anteriorly, anterior angles prominently acutely spinous, lateral angles robustly produced, their apices broadly truncate, lateral margins strongly oblique, anterior margin behind head and the posterior margin before scutellum truncate; scutellum much longer than broad at base, a little shorter than corium, the apical area strongly attenuated and centrally apically longitudinally depressed; corium with the inner angle rounded, the apical margin oblique; membrane passing the abdominal apex, the veins longitudinal; rostrum reaching or slightly passing the posterior coxæ, basal joint not extending beyond the bucculæ and only slightly passing anterior half of head, second joint slightly passing the

anterior coxæ, third joint reaching the intermediate coxæ; pro- and mesosterna centrally longitudinally carinate; abdominal basal spine long, almost reaching the anterior coxæ; abdomen distinctly, centrally, longitudinally ridged; odoriferous apertures transverse, elongate; legs of moderate length; tarsi three-jointed, the second joint small.

Allied to *Priassus*, Stål, from which it principally differs by the structure of the pronotum, which in *Okeanos* is shorter, the lateral angles not acutely produced, the anterior angles distinctly acutely prominent, the lateral margins entire, neither crenulate nor serrate.

Okeanos quelpartensis, sp. n.

Purplish brown; the anterior area of pronotum, apex of scutellum, connexivum, body beneath, and legs ochraceous; lateral pronotal angles black; central basal margin of pronotum, lateral margins of scutellum (not reaching apex), and lateral margins of corium (more or less) resplendent olivaceous green; antennæ black, fourth and fifth joints fuscous, the first joint and bases of fourth and fifth joints ochraceous; head thickly, coarsely, darkly punctate; pronotum with the anterior pale area moderately punctate, the basal area coarsely punctate and moderately rugulose; scutellum somewhat sparingly coarsely punctate, on central disk obscure indications of a central longitudinal ridge; corium very thickly and somewhat coarsely punctate; prosternum finely but distinctly punctate; abdominal spiracles black; other structural characters as in generic diagnosis.

Long. 18 mm.; exp. pronot. angl. 10 mm.

Hab. Corea; Quelpart Island (*S. Ichikawa*, Brit. Mus.).

Gudea, gen. nov.

Head about as long as breadth between outer margins of eyes; lobes equal in length, but the apices of the lateral lobes obliquely inclined inwardly; lateral margins distinctly sinuate a little in front of eyes, and thence to apex slightly reflexed; ocelli nearer eyes than to each other; antennæ five-jointed, first joint stout, remaining joints slender, first not reaching apex of head, remaining joints almost subequal in length; pronotum about half as long as broad at base, lateral margins concavely oblique, somewhat coarsely serrate, lateral angles broadly slightly prominent, their apices subtruncate, anteriorly rounded, posteriorly slightly toothed or angulated, anterior angles distinct, deflected from about middle towards head, anterior margin truncate behind base

of head, posterior margin truncate; scutellum considerably longer than broad at base, the apical area elongately attenuate, the apex subangulate; corium about as long as scutellum and half of pronotum combined, its inner angle rounded, apical margin oblique, slightly sinuate, apex a little angularly produced; membrane moderately passing the abdominal apex, the veins longitudinal; rostrum passing the posterior coxæ, first joint not extending beyond bucculæ, which only extend about two-thirds from apex, second joint passing anterior coxæ, third passing intermediate coxæ; pro- and mesosterna centrally, longitudinally, finely carinate, basal abdominal spine or tubercle broad, short, obtuse, not passing the posterior coxæ; femora moderately thickened, about equal in length to tibiæ, tarsi three-jointed, second joint shortest; odoriferous apertures shortly transverse, moderately curved, a little longer than first joint of tarsi.

Allied to *Lelia*, Walk., from which it is separated by the short obtuse basal spine or tubercle to the abdomen beneath, &c.

Gudea ichikawana, sp. n.

Above pale brownish ochraceous, thickly darkly punctate; antennæ ochraceous, base of first joint and apical areas of third, fourth, and fifth joints more or less piceous; head thickly darkly punctate, the lateral lobes obliquely transversely wrinkled; pronotum thickly darkly punctate, the lateral margins pale stramineous, apices of the lateral angles black; scutellum a little more sparingly punctate than the corium; body beneath and legs ochraceous; apex of rostrum black; prosternum finely punctate; structural characters as in generic diagnosis.

Long. 20 mm.; exp. pronot. angl. 11½ mm.

Hab. Corea; Quelpart Island (*S. Ichikawa*, Brit. Mus.).

Genus Jalloides.

Jalloides, Schout. in Wytsm. Gen. Ins. fasc. lii. p. 41 (1907).

Type, *J. rubricosus*, Stäl.

Jalloides opulentus, sp. n.

Head and pronotum testaceous, apical area of head bluish black; antennæ bluish black; scutellum and corium blue or purplish blue, apex of scutellum testaceous; membrane blackish, the apical margin ochraceous; connexivum testaceous; body beneath and legs ochraceous; disks of meso-

and metasterna, apical segment of abdomen, tibiæ, tarsi, and apices of femora, and apex of rostrum bluish or blackish blue; antennæ with the first joint not reaching apex of head, second and fourth and third and fifth joints subequal in length; head obscurely punctate and wrinkled; pronotum with the lateral angles a little prominent, the lateral margins sinuate, the anterior angles prominent, sparsely and irregularly punctate; scutellum somewhat coarsely punctate, with a more or less distinct longitudinal levigate line; corium thickly finely punctate, the basal lateral margin testaceous; rostrum reaching the intermediate coxæ.

Var. *a*.—Pronotum with a prominent, central, oblong, bluish-black spot.

Var. *b*.—Resembling var. *a*, but pronotum with an additional bluish-black spot on each lateral margin.

Long. 11–12 mm.

Hab. N. Queensland (*Kelsall*, Brit. Mus.); Cairns (Coll. Dist.); near Port Moresby (Coll. Dist.).

Differs from *J. rubricosus*, Stål, apart from colour-markings, by the more elongate form, the less strongly punctured pronotum and scutellum, the more sinuate lateral margins of the pronotum, &c.

Jalloides versicolor, sp. n.

Head, pronotum, and scutellum ochraceous, thickly somewhat darkly punctate; base of head (broadest near eyes), irregular margins of the cicatrices, and two large spots at base of pronotum black; apex of scutellum ivory-white; corium bluish black, some light suffusions and a large round spot near apex testaceous; membrane blackish, its apex hyaline and passing the abdominal apex; body beneath and legs pale ochraceous; sternum more or less punctured and spotted with black, a large black lateral spot on each abdominal segment beneath, and a subapical spot of the same colour; antennæ pale ochraceous, apical area of the third and the whole of the fourth and fifth joints black, first joint not reaching apex of head, remaining joints almost subequal in length; head scarcely punctate except on the dark basal patches near the ocelli; pronotum and scutellum somewhat sparingly coarsely punctate; corium more thickly and finely punctate; anterior femoral spine prominent.

Long. $8\frac{1}{2}$ mm.

Hab. Queensland; Kuranda (*F. P. Dodd*, Brit. Mus.).

Genus Cantheconidea.

Cantheconidea, Schout. in Wytsm. Gen. Ins. fasc. lii. p. 44 (1907).

Type, *C. javana*, Dall.

Cantheconidea thomsoni, sp. n.

Purplish black; head thickly punctate, the lateral lobes broadly reflexed at their apical areas and apically rounded, a short central longitudinal line at base, a small marginal spot in front of each eye, and a small obscure spot at apex of central lobe ochraceous; pronotum very coarsely punctate and subrugulose, the anterior lateral margins serrate, the lateral angles shortly produced and recurved, their apices roundly angulate, the anterior lateral margins and nine or ten irregular spots on anterior area ochraceous; scutellum coarsely punctate, more finely so and with a levigate longitudinal space on apical area, a levigate spot near each basal angle, and the apex ochraceous; corium thickly, somewhat finely punctate; membrane bronzy, distinctly passing the abdominal apex; connexivum ochraceous, punctate, with large blackish spots at the incisures; body beneath and legs ochraceous; sternum somewhat irregularly spotted and marked with black; abdomen with the spiracles, marginal spots, and some central elongate spots black; apices of femora, bases and apices of tibiæ, and apices of tarsi black; rostrum reaching the posterior coxæ, its apex black; antennæ black, first joint not reaching apex of head, second, third, and fourth joints subequal in length (fifth mutilated in type).

Long., ♂, 14 mm.; exp. pronot. angl. 8 mm.

Hab. N.E. China; Shan-hai-kwan (*F. M. Thomson*, Brit. Mus.).

Genus Platynopus.

Platynopus, Amy. & Serv. Hist. Hém. p. 79 (1843).

Type, *P. melanoleucus*, Westw.

Platynopus turneri, sp. n.

Head longer than broad, ochraceous, much mottled with resplendent green, very coarsely punctate, the punctures in somewhat longitudinal series; antennæ brownish ochraceous, third, fourth, and fifth joints (excluding bases) infuscate, first joint short, not reaching apex of head, second and fourth a little longest and subequal in length, third and fifth also

subequal; pronotum brownish ochraceous, very coarsely darkly punctate, the lateral margins entire, not crenulate, somewhat broadly pale ochraceous and almost impunctate, the lateral angles black, robust, moderately longly and almost straightly produced, a more or less distinct central longitudinal ridge; scutellum brownish ochraceous, coarsely darkly punctate, with a central longitudinal ridge, the apex more or less pale ochraceous and darkly punctate, the apex broad, truncately rounded; corium brownish ochraceous, thickly but more finely punctate, in some specimens suffused with greenish, the apical margin narrowly pale levigate; membrane bronzy brown, with a large pale spot on the lateral and a smaller spot on the apical margins pale hyaline; body beneath ochraceous, darkly punctate, here and there suffused with greenish, a more or less distinct central longitudinal series of blackish spots to abdomen; legs ochraceous, apices of femora and bases and apices of tibiæ more or less brownish, anterior tibiæ not dilated with a distinct spine beyond middle, anterior femora with a moderately long spine near apex; rostrum reaching the posterior coxæ.

Long., ♂ ♀, 9–13 mm.; exp. pronot. angl. 6–7 mm.

Hab. Queensland; Mackay (*R. E. Turner*, Brit. Mus.); Townsville (*F. P. Dodd*, Brit. Mus.).

Allied to *P. melacanthus*, Boisd.; apices of pronotal lateral angles entire, not notched, &c.

Janeirona, gen. nov.

Subelongate; head longer than broad between eyes, the lateral margins distinctly, somewhat strongly reflexed, lateral lobes passing the apex of the central lobe but not meeting beyond it, their apices truncate; ocelli near base, a little nearer to eyes than to each other, a distinct spine before eyes on each antenniferous tubercle; antennæ pilose, basal joint globosely incrassated, slightly shorter than head, but longly passing it, second joint about three times as long as first, considerably longer than third (remaining joints mutilated in typical specimen); pronotum about twice as broad at base as long, the anterior angles moderately obtusely transversely prominent, lateral margins oblique, lateral angles subprominent, posterior margin truncate, anterior margin moderately concave; scutellum much longer than broad, the apical third moderately attenuated, the apex subangulate and reaching or slightly passing the inner apical angle of the corium, a little depressed behind middle; corium elongate, its apical angle distinctly produced; membrane slightly

passing abdominal apex, the venation longitudinal, with a distinct transverse cell at base; rostrum reaching the posterior coxæ, first joint almost reaching base of head, second passing anterior coxæ, third not quite reaching intermediate coxæ; sternum centrally, finely, longitudinally carinate, becoming considerably prominent on the metasternum; abdomen only moderately convex, spiracles on basal segment exposed, distinctly visible, central base slightly roundly produced, but not reaching posterior coxæ, apical angles of sixth segment (in ♂) distinctly produced, apical angles of anal segment strongly, broadly, angularly produced, central apical margin of sixth segment truncate; tarsi three-jointed.

By the elongate scutellum this genus should represent a new division among the first four enumerated by Horvath (1900) in his table of divisions in the Tessaratominæ; it is the third genus of the subfamily at present recorded from the Neotropical Region.

Janeirona insignis, sp. n.

Black; a spot at lateral angles of pronotum, a transverse spot at base and a small discal spot beyond middle of corium, legs and rostrum ochraceous; basal longitudinal disk of abdomen beneath testaceous; antennæ distinctly palely pilose; head more or less transversely wrinkled; ocelli sanguineous; pronotum and scutellum somewhat thickly finely punctate, the latter with two obscure central longitudinal raised lines on the apical area; corium thickly finely punctate; all the ochraceous spots impunctate; body beneath more or less thickly finely punctate; tarsi pale ochraceous, longly pilose; other structural characters as in generic diagnosis.

Long., ♂, 19 mm.; exp. pronot. angl. 8 mm.

Hab. Fifty miles west of Rio Janeiro, 1000–1200 feet (*Sir Wm. Smith*, Brit. Mus.).

Genus Megymenum.

Megymenum, Laporte, Ess. Hém. p. 52 (1832).

Type, *M. dentatum*, Boisd.

Megymenum pratti, sp. n.

Fuscous brown, more or less palely pilose; membrane pale ochraceous; head above concave, before eyes with a somewhat longly acute lateral spine directed both a little upwardly and backwardly; antennæ fuscous brown, the apical

joint ochraceous, first joint not reaching apex of head, second longest, third and fourth subequal; pronotum nodulose, a more distinct oblong nodule near centre of anterior margin, anterior angular spines long, curved and slender, lateral margins centrally angulate; scutellum with a centrally longitudinal ridge not reaching apex; lateral abdominal margins strongly obtusely angularly toothed.

Long. 13 mm.; exp. pronot. angl. 7 mm.

Hab. Centr. China; Kiukiang (*Pratt*, Brit. Mus.).

Closely allied to *M. gracilicornis*, Dall., from which it differs by the longer, more slender, and acute anterior pronotal angles, which in Dallas's species are shorter, broader, flattened, and with their apices acutely pointed.

Genus Sastragala.

Sastragala, Amy. & Serv. Hist. Hém. p. 155 (1843).

Type, *S. uniguttata*, Don.

Sastragala quinquemaculata, sp. n.

Head and pronotum ochraceous, the latter darkly punctate; lateral pronotal angles and the scutellum and corium testaceous; two large spots near base and the apex of scutellum, a somewhat oblique spot behind middle, and the costal area to corium ochraceous; membrane pale bronzy subhyaline; body beneath ochraceous, abdominal apex purplish red; antennæ ochraceous, basal joint stoutest, a little curved, considerably passing apex of head, second slightly longer than either first or third and subequal to fourth; head somewhat irregularly impressed; pronotum somewhat sparingly but very coarsely punctate, the lateral angles longly produced and recurved; scutellum more finely punctate, excepting the ochraceous markings, which are impunctate; corium thickly and more coarsely punctate; membrane passing the abdominal apex; sternal process elevated, compressed, anteriorly extending slightly beyond base of head; abdomen beneath centrally longitudinally ridged; rostrum about reaching the posterior coxæ.

Long., ♀, 14½ mm.; exp. pronot. angl. 11 mm.

Hab. Philippine Islands; Irisan, Benquet Prov., Luzon (*R. C. McGregor*, Brit. Mus.).

The longly produced and recurved pronotal angles and the very prominent macular markings render this species easily recognizable.

XL.—*New Species of Heterocera from Costa Rica.*—VII.

By W. Schaus, F.Z.S.

Arctiadæ.

Subfamily *Nolinæ*.

Celama carilla, sp. n.

Palpi white, fringed in front with light brown. Body white, the abdomen faintly tinged with grey; a small dorsal patch of yellowish scales at base. Fore wings white; a small dark brown spot at base of median and some diffuse light brown basal scales; raised tufts in cell light brown; lines light brown, irrorated with a few dark scales; antemedial slightly curved, more heavily darkly scaled above submedian; medial slightly curved; postmedial outcurved beyond cell, punctiform on veins 2–6; subterminal inset below vein 3; an indistinct marginal line. Hind wings white, tinged with grey, more darkly on outer margin.

Expanse 13 mm.

Hab. Carillo.

Rœselia pernitens, sp. n.

♂. Palpi brown. Head, collar, and thorax white. Abdomen light brown, banded with white. Fore wings silvery white; an antemedial spot on costa brown, irrorated with fuscous scales; a medial triangular spot on costa grey-brown, edged inwardly by a black line; smaller spots on costa to apex; outer margin broadly shaded with brown from vein 6 to tornus, and irrorated with fuscous and silvery scales. Hind wings white, the veins and outer margin tinged with grey.

Expanse 14 mm.

Hab. Guapiles.

Rœselia placens, sp. n.

♂. Palpi light brown. Head white; a dark brown line across frons. Collar and shoulders buff, edged with brown. Thorax lilacine white. Abdomen light brown; some white at base. Fore wings lilacine white; costal margin and cell anteriorly light brown, suffusing with a large light brown space at end of cell, irrorated with dark brown, and with two dark brown lines on costa above it; costa terminally grey; a postmedial grey-brown shade, suffusing with brown space

at end of cell; a broad subterminal grey shade, slightly inset at vein 5 and at vein 2; the outer margin thickly irrorated with light brown. Hind wings grey-brown; an indistinct dark shade on discocellular.

Expanse 17 mm.

Hab. Tuis.

Rœselia unilinea, sp. n.

♂. Palpi brown, tipped with white. Body white, the abdomen tinged with brown. Fore wings white; a brown and fuscous spot on costa near base; a medial brown spot on costa, from which a well-marked brown line extends to inner margin, being somewhat oblique and inbent at submedian fold; some faint brown shades on costa towards apex and along outer margin. Hind wings white, faintly tinged with light brown on outer margin.

Expanse 15 mm.

Hab. Carillo.

Rœselia sabulosa, sp. n.

♂. Palpi, head, collar, and thorax whitish, thinly irrorated with brown. Abdomen whitish buff. Fore wings buff-brown, irrorated with olive-brown and fuscous scales; a geminate fuscous line on costa near base; a broad medial darker shade across costa and cell, edged with fuscous points; a geminate postmedial row of fuscous points on veins, inwardly oblique to submedian fold, then straight; a subterminal row of brown streaks on veins; terminal dark clusters of scales on veins. Hind wings dirty white; a dark grey terminal line and a similar spot on discocellular.

Expanse 25 mm.

Hab. Poas, Juan Vinas.

Rœselia decepta, sp. n.

♂. Palpi white, shaded with brown at base. Head and thorax white. Abdomen greyish. Fore wings white; basal, antemedial, and medial dark grey shades on costa, the last larger and suffusing with fuscous line on discocellular; a faint antemedial line, inwardly oblique from costa; some medial streaks and irrorations below cell; the postmedial outcurved around cell, fine, punctiform, geminate on inner margin; a subterminal irregular greyish shade, outwardly oblique from costa, suffusing with terminal greyish shades at tornus; cilia very long, grey. Hind wings whitish grey. Underneath,

the costal margin of hind wings is coarsely irrorated with fuscous grey.

Expanse 11 mm.

Hab. Guapiles.

Subfamily *Lithosianæ*.

Macroptila monstralis, sp. n.

♂. Frons brown. Vertex, collar, and thorax grey. Abdomen whitish. Legs whitish, the fore tibia above with ridge of long ochreous hairs. Fore wings light grey, becoming dark grey on inner margin, costal margin and veins above 3 white; the extreme costa finely ochreous. Hind wings: the inner area broadly white; the costal portion above median light brown; the outer margin from vein 2 to apex shaded with dark grey; a small spot of androconia in cell at base.

Expanse 30 mm.

Hab. Sixola.

Fore wings with veins 3 and 4 on rather long stalk; 6 from near upper angle of cell; 7–9 stalked; 10 free. Hind wings with 3 and 4 from lower angle; 5 absent or on long stalk with 4; 6 and 7 from upper angle apart; costal margin straight and with a projecting lobe before apex.

Macroptila nubecula, sp. n.

♂. Head, collar, and thorax lilacine grey, the frons paler. Abdomen buff-white. Fore wings: costal margin, cell, and from vein 3 to apex silvery white, faintly tinged with buff; below cell lilacine buff, shading to lilacine grey above and below submedian. Hind wings faintly tinged with buff and shaded with grey at apex; the cell filled with a large patch of dark brown androconia, partly covered by an upturned ridge of long hairs on median vein. Underneath whitish, the costal margins yellowish buff.

Expanse 32 mm.

Hab. Sixola, Tuis, Esperanza.

This species will fall into a new section. Fore wing with cell narrow, the median arched; vein 6 from well below angle of cell; 7–9 stalked; 10 free. Hind wing with a large patch of androconia in cell; veins 3–5 stalked; veins 6 and 7 stalked, downturned; the costal margin concave before apex.

Aptilosia, gen. nov.

Proboscis fully developed. Antennæ of male with short

bristles and minute cilia. Abdomen covered with rough hair. Fore wings broad; vein 2 from beyond middle; 3 from before angle; 4 and 5 from a point; 6 from near upper angle; 7–10 stalked; 11 anastomosing with 12. Hind wings broad; the costal margin arched and oblique on outer half; apex rounded; outer margin nearly straight to anal angle; a large patch of androconia in cell; vein 2 from beyond middle of cell; 3 from before angle; 4 from angle; 5 from above angle; 6 and 7 coincident.

Aptilosia crocea, sp. n.

♂. Head and thorax lilacine grey. Abdomen pale yellowish. Fore wings yellowish white; the inner margin broadly lilacine grey, narrowing at tornus. Hind wings pale yellowish, with a ridge of long yellow hairs along median.

Expanse 29 mm.

Hab. Juan Vinas, Tuis, Guapiles.

Agylla erigone, sp. n.

♂. Head and thorax dark grey. Abdomen light grey; buff hairs on anal segment. Fore wings silvery white, pale grey below cell and vein 2, shading to dark grey along inner margin; the costa finely ochreous. Hind wings white. Fore wings underneath grey, shaded with pale buff along costal margin, at end of cell, and slightly below cell. Hind wings underneath white, shaded with grey from apex to vein 5.

Expanse 40 mm.

♀. Fore wings white, the inner margin broadly dark grey. Fore wings underneath grey; the costal margin except at base white; a whitish shade at end of cell, extending beyond it, and the postmedial space between veins 2–6 shaded with white. Hind wings below white, with a faint trace of grey at apex.

Expanse 44 mm.

Hab. Juan Vinas, Volcano Turrialba, 5800 ft.

Allied to *A. hampsoni*, Dogn.

Agylla asra, sp. n.

♂. Head and thorax dark grey, abdomen lighter grey. Fore wings grey, darkest along inner margin; veins except submedian broadly white; a dark grey terminal line; the cilia divided by a dark grey line. Hind wings white at base and along inner margin, otherwise grey; a black spot on

costa near base. Underneath dark grey; the outer half of costa of fore wings shaded with buff; the basal and inner area of hind wings white.

Expanse 20 mm.

Hab. Sixola.

Near *A. hampsoni*, Dogn.

Agylla subcinerea, sp. n.

♂. Head, collar, and thorax brownish grey; some whitish hairs on basal joint of antennæ. Abdomen dark grey above, with lighter grey hairs at base and on terminal segment. Fore wings white; the basal third of costa finely dark grey, the outer two-thirds finely creamy buff; the inner margin below fold dark grey. Hind wings: the base and inner margin white, otherwise grey; the cilia white. Underneath dark grey; the inner area of hind wings white; the costal margin of fore wings as above.

Expanse 27 mm.

♀. Similar to male, but with costa of fore wings white; the hind wings only tinged with grey at apex. Underneath paler grey, the white on hind wings more extended.

Expanse 28 mm.

Hab. Tuis, Juan Vinas, Los Bajos.

Near *A. sanctæ johannis*, Schs.

Agylla albivenis, sp. n.

♂. Palpi dark brown, fringed with whitish. Frons pale buff. Vertex, collar, and thorax dark grey-brown. Abdomen grey above, the lateral tufts and underneath whitish buff. Legs white; fore and hind tibiæ streaked with dark grey; fore tibia black, with white rings. Fore wings: the costa with light brown downturned scales, not reaching base; the cell and veins except submedian white; intervenal spaces light grey, darker between 2 and 4 and at end of cell; the inner margin fuscous grey. Hind wings white; fuscous shadings on costal and outer margin. Underneath, the fore wings fuscous grey, becoming paler on outer margin; the hind wings white, tinged with buff on costa.

Expanse 26 mm.

♀. Frons white. Fore wings white, tinged with grey between 2 and 3 near cell; the inner margin dark fuscous grey. Hind wings white; a few fuscous scales at apex.

Expanse 28 mm.

Hab. Juan Vinas, Tuis.

Section near *A. barbicosta*, H.

Agylla pœasia, sp. n.

♂. Head, collar, and thorax smoky grey; patagia tipped with white. Abdomen darker grey, with light grey hairs at base; terminal segment light brown. Fore wings silvery white; the inner margin smoky grey. Hind wings white, tinged with yellow. Underneath: fore wings fuscous grey; a white streak below subcostal; the inner margin white. Hind wings white.

Expanse 35 mm.

♀. Differs from the male in having the hind wings clearer white; the fore wings underneath whitish grey.

Expanse 36 mm.

Hab. Poas.

Near *A. sericea*, Druce.

Agylla abrosa, sp. n.

♂. Frons dark brown. Vertex, collar, thorax, and abdomen above light greyish brown; abdomen laterally and underneath white. Fore wings silky white; the inner margin narrowly light greyish brown. Hind wings white, rather broad, the outer margin truncate from apex to vein 3, then rounded. Fore wings underneath thickly irrorated with brown, the base of costa darker; the inner margin below submedian whitish buff. Hind wings below with the costa faintly tinged with brown.

Expanse 33 mm.

Hab. Volcano Turrialba, 5800 ft.

Agylla subnacula, sp. n.

♂. Head, collar, and thorax dark grey; patagia outwardly and tipped with white. Abdomen above light grey. Fore wings silvery white; the inner margin below fold brownish grey. Hind wings white, shaded with grey at anal angle. Fore wings below white; the inner margin grey; a large postmedial greyish-brown patch from vein 2–11; the outer margin tinged with grey-brown.

Expanse 37 mm.

Hab. Cartago, Juan Vinas, Volcano Turrialba.

Belongs to section near *A. involuta*, Hmpsn.

Agylla exscissa, sp. n.

Head, collar, and thorax smoky grey, the frons buff. Abdomen buff-grey. Fore wings narrow terminally, the

inner margin deeply lobed on basal two-thirds to vein 2, then straight to tornus at vein 3, silvery white; the lobe on inner margin brown-grey; the costa finely ochreous. Hind wings broad, the outer margin rounded, silvery white; a large yellow patch of androconia at base in cell, covered by lobe of fore wings; some buff shadings below and beyond cell to near apex; a postmedial brown-grey shade above vein 2; the inner margin dull white. Fore wings below white; a fuscous streak on base of costa; a streak of cinnamon-brown androconia below cell; the medial space roughly scaled, yellow; the outer margin suffused with light brownish grey. Hind wings below black-brown; some ochreous shadings at base; the inner margin white; the outer margin above vein 3 shaded with white.

Expanse 35 mm.

Hab. Juan Vinas, Sixola.

Belongs to a new section near *A. argentea*, Wlk.

Balbura fasciata, sp. n.

Body black; the patagia roseate. Fore wings light buff-brown; the submedian fold, costa, and inner margin finely black; some roseate at base, limited by a black shade; a fuscous streak on costal margin and one in cell suffusing at end of cell with a broad, transverse, medial, fuscous shade, which extends from costal to inner margins; long terminal black intervenal streaks between veins 3–7, the streak between 5 and 6 extending from cell; cilia black. Hind wings dark brown. Underneath dark brown.

Expanse 34 mm.

Hab. Guapiles, Sixola.

Differs from typical *Balbura* in having, on hind wings, veins 4 and 5 from lower angle, and 6 and 7 from upper angle of cell.

Balbura intervenata, sp. n.

♂. Head, collar, and abdomen black. Thorax red; the patagia fringed with black outwardly. Fore wings fuscous brown; the inner margin broadly black; terminal black streaks between the veins, the streak between 5 and 6 from within cell. Hind wings black; the cell, below and beyond it semihyaline.

Expanse 27 mm.

Hab. Sixola.

In this species veins 4 and 5 on hind wings are from lower angle of cell.

DOLICHESIA, gen. nov.

Proboscis well developed. Palpi porrect, reaching beyond frons; female antennæ flattened, laminate. Hind tibia with the medial spur absent. Fore wing long and narrow, the costa arched and falcate; vein 2 from middle of cell; 3 from well before angle; 5 from a little above 4; 6 from upper angle; 7, 8, 9 stalked; 7 from beyond 9; 10 free; 11 anastomosing with 12. Hind wings: vein 5 absent; 6 and 7 coincident.

Near *Eudoliche*, Mösch.

Dolichesia falsimonia, sp. n.

Head and thorax grey-brown. Abdomen roseate. Thorax below white; legs grey-brown. Fore wings grey-brown; a pale greyish medial shade from costa incurved to inner margin near base, followed by a dark brown oblique streak from cell to inner margin; a similar postmedial oblique streak from vein 4 to inner margin; a light reddish-brown terminal line from costa before apex to vein 4; terminal black spots from below apex to tornus, where they suffuse and extend on to cilia; cilia white except at apex, where they are black. Hind wings roseate; the outer margin broadly black, narrowing at anal angle. Fore wings below fuscous; the inner margin grey; some roseate postmedially at submedian. Hind wings underneath as above, with the costa narrowly black.

Expanse 16 mm.

Hab. Sixola.

Cloësia digna, sp. n.

Body and fore wings above dark metallic blue. Hind wings fuscous brown, thinly scaled; dark metallic blue streaks on inner margin, along vein 2, and on outer margin below apex.

Expanse 28 mm.

Hab. Sixola.

Allied to *C. parthia*, Druce.

Thyone grisescens, sp. n.

Body and wings violaceous grey, the hind wings and abdomen slightly darker than the thorax and fore wings.

Expanse 22 mm.

Hab. Juan Vinas, Tuis, Guapiles.

Allied to *T. muricolor*, Schs.

Afrida parvula, sp. n.

Head, collar, and thorax lilacine buff, the vertex tinged with light brown. Abdomen buff-brown. Fore wings greyish buff; a broad curved antemedial black shade, not reaching inner margin; a broad dark grey medial shade, edged by black lines, tinged with brown, and crossed by a fine black line, the outer edge incurved, and followed by a black point on discocellular; some marginal light brown shadings and terminal dark points. Hind wings suffused with fuscous, darkest terminally; a dark discal point.

Expanse 14 mm.

Hab. Tuis, Juan Vinas.

Chrysochlorosia magnifica, sp. n.

♂. Body dark metallic bluish green. Fore wings dark green; the outer margin and cilia deep blue or black according to the light. Hind wings black; the cilia dark metallic green. Underneath, the wings are dark bluish green, somewhat metallic.

Expanse 22 mm.

Hab. Sixola.

Near *C. splendida*, Druce.

Odozana sixola, sp. n.

♂. Head and collar black. Thorax and abdomen above crimson; abdomen ventrally black. Fore wings blackish brown, with fine slightly iridescent striæ. Hind wings black, the inner margin from within cell to near angle crimson. Underneath dull dark brown; the inner margin of fore wings with light brown hairs; the crimson patch on hind wings as above.

Expanse 18 mm.

Hab. Banana River, Sixola.

Allied to *O. methœmata*, Hmpsn.

Odozana inconspicua, sp. n.

♀. Head, collar, and wings dark brown; the fore wings with iridescent striæ. Thorax and basal tufts on abdomen crimson; abdomen otherwise black.

Expanse 17 mm.

Hab. Sixola.

Odozana decepta, sp. n.

♂. Head and collar blue-black. Thorax and fore wings dark brown, with iridescent striæ. Abdomen brown at base, otherwise crimson above, black ventrally. Hind wings dull dark brown.

Expanse 19 mm.

Hab. Sixola.

Metalobosia ducalis, sp. n.

♂. Head, collar, thorax, and fore wings dark metallic green. Abdomen crimson; brown hairs at base; terminal segment black; lateral whitish tufts. Thorax below and legs metallic blue-black; hind tibia with long crimson tufts. Hind wings crimson; the apex black, narrowing towards vein 3.

Expanse 18 mm.

Hab. Juan Vinas.

Belongs to new section: the inner margin of fore wings evenly curved; the hind wings broad, truncate towards anal angle, which is slightly produced; a broad fold on inner margin, containing a tuft of yellow scales at anal angle.

Nodozana picturata, sp. n.

Head and thorax white. Abdomen pale yellowish. Fore wings: the base, basal half of costal margin, and apex white, otherwise pale yellow; a faint antemedial curved orange line; a large orange spot medially from cell to inner margin; a postmedial fine orange line from costa to vein 5; a subterminal orange line touching outer margin at vein 4, then inbent, followed by an oblique greyish shade from costa to vein 3; cilia grey. Hind wings pale yellowish. Underneath a broad grey shade along costal margin of fore wings, curving before apex.

Expanse 13 mm.

Hab. Sixola.

Near *N. pyrophora*, Hmpsn.

Lycomorphodes correbioides, sp. n.

♂. Head ochreous, some fuscous on frons; collar and thorax ochreous, crossed by a black line outwardly. Abdomen fuscous; anal tufts ochreous. Fore wings ochreous; a broad medial fuscous shade, except on median vein and submedian fold; the termen broadly fuscous above vein 3, more

narrowly so below 3. Hind wings fuscous; the costal margin ochreous, not reaching apex.

Expanse 16 mm.

♀. Differs in having the black markings more reduced.

Expanse 18 mm.

Hab. Sixola, Tuis.

Veins 3–5 on fore wings stalked; fore tibia of male without tuft of hair.

Talara cara, sp. n.

Head ochreous; collar and thorax reddish ochreous. Abdomen black; some reddish-ochreous hairs at base dorsally. Fore wings ochreous, tinged with red except on costal margin; the outer margin broadly black from apex to submedian. Hind wings black, the base shaded with roseate. Underneath the black more extended, leaving a reddish space on less than basal half of wings, which is, however, somewhat produced on costal margin of fore wings; the inner margin of fore wings yellowish.

Expanse 16 mm.

Hab. Sixola.

Talara lepida, sp. n.

♂. Head, collar, thorax, and fore wings grey, finely irrorated with darker scales. Abdomen crimson above; underneath black, banded with roseate. Hind wings crimson; the apex broadly black, narrowing to before anal angle.

Expanse 13 mm.

Hab. Sixola.

Talara esperanza, sp. n.

Head, thorax, and anal hairs reddish. Abdomen pale roseate buff. Legs red, tarsi ringed with black. Fore wings yellowish; the veins and submedian fold broadly reddish; a fine black medial line, outcurved through cell, inwardly angled at fold and outwardly at submedian vein, preceded by black irrorations in cell and antemedially above and below submedian fold; the postmedial black line outcurved, inwardly angled on fold, followed by black irrorations; cilia luteous. Hind wings roseate; cilia luteous.

Expanse 12 mm.

Hab. Esperanza, Tuis, Sixola, Guapiles.

Near *T. ditis*, Butl.

Talara rubida, sp. n.

Head, collar, thorax, base of abdomen, and fore wings red; abdomen otherwise and hind wing black; some red at base of hind wings. Legs black; tarsi roseate white at base. Wings underneath: fore wings roseate, with a large fuscous patch on outer half, not extending above vein 8 nor quite reaching inner margin; hind wings roseate at base, otherwise black.

Expanse 17 mm.

Hab. Juan Vinas, Tuis.

Near *T. coccinea*, Butl.

Paratalara commixta, sp. n.

♂. Head and collar white. Abdomen above brown, underneath and anal hairs whitish buff. Fore wings: basal third whitish buff; an antemedial dark grey spot in cell and a larger similar spot on inner margin, the two connected by greyish irrorations; a grey streak on costa above cell-spot; medial space buff-brown below subcostal, greyish above it, limited outwardly by a dark brown line, angled and incurved below vein 4; a fine dark brown line above vein 2, and another below vein 3; a cluster of dark scales at end of cell and just beyond it; outer space white; a large cluster of brown scales between 2 and 5 and a smaller cluster between 4 and 6. Hind wings white; a small spot of black androconia in end of cell, edged with grey; the inner margin tinged with buff; some buff scales on outer margin. Fore wings below with a patch of coarse scales at and above end of cell anteriorly.

Expanse 16 mm.

Hab. La Florida.

Clemensia mucida, sp. n.

♂. Palpi brown. Body dark grey. Fore wings greyish white, thinly irrorated with brown along margins; a fuscous brown basal line not reaching inner margin; a heavier antemedial line, faintly curved, interrupted above and below submedian; a broad postmedial brown shade outwardly shaded with fuscous brown, rather broadly from vein 2 to inner margin, and containing a black oblique streak on discocellular; a subterminal brown shade on costa and between 4 and 6; terminal brown points extending on cilia. Hind wings grey. Underneath grey, with indistinct discoidal spots.

Expanse 15 mm.

Hab. Juan Vinas.

Would follow *C. parapatella*, Dogn., in Sir George Hampson's Catalogue.

Clemensia cincinnata, sp. n.

♂. Palpi and abdomen dark brown. Head, collar, and thorax grey-brown mottled with white. Fore wings greyish white, irrorated with brown and fuscous and shaded with dark grey and brown except at base and on outer margin; a fine black basal line; a broad fuscous-brown antemedial curved line; a black streak on discocellular; medial and subterminal black spots on costa; three medial black points on submedian; terminal brown points; cilia white, spotted with brown at vein 4 and apex. Hind wings: costa silvery white; cell pale yellow; inner area and outer margin broadly dark grey, narrowing at apex. Fore wings below: base of cell with upturned silvery scales, downturned at middle of cell; a patch of brown androconia above submedian and long yellowish hairs.

Expanse 21 mm.

♀. Anal hairs of abdomen whitish. Fore wings whiter; the antemedial followed by a fine line; an ochreous shade medially above submedian; a medial and a postmedial brown line. Hind wings fuscous grey.

Expanse 18 mm.

Hab. Juan Vinas.

Clemensia leopardina, sp. n.

Palpi black. Head, collar, and thorax light grey; four black spots on metathorax. Abdomen dark grey; anal hairs buff-brown. Fore wings light grey, a basal black spot on costa and one on inner margin; a subbasal spot on costa, one below cell, and a short streak below submedian; an antemedial row of spots on costa, subcostal, below cell, and on submedian; a spot on inner margin nearer base and one on submedian fold at origin of ochreous streak which extends to a subterminal spot above inner margin; a spot in middle of cell, followed by a medial row of small spots almost coalescing; a large spot at end of cell; a postmedial row of streaks inset below vein 3 and replaced by spots on submedian and inner margin; subterminal large spots on costa, between 4 and 6, and on inner margin; terminal black points; cilia spotted with fuscous at vein 4 and at apex. Hind wings whitish; the outer margin irregularly dark grey.

Expanse 22 mm.
Hab. Sixola.
Allied to *C. ophrydina*, Dr.

ANAULOSIA, gen. nov.

Proboscis fully developed; palpi upturned; anal segment tufted. Fore wings: apex acute; outer margin excised below apex and above tornus; vein 2 from just beyond middle of cell; 3 from well before angle; 4 and 5 from lower angle; 6 from just below upper angle; 7, 8, 9 on long stalk; 10 and 11 free. Hind wing with vein 2 from near angle; 3 and 4 coincident; 5 from well above angle; 6 and 7 on very long stalk; 8 from middle of cell.

Anaulosia impolita, sp. n.

Head, collar, thorax, and fore wings dull leaden brown. Abdomen and hind wings dull dark brown. Fore wings: a faint postmedial whitish line from costa, outwardly oblique; some postmedial, inwardly oblique, faint whitish spots from vein 4; a terminal whitish shade, interrupted between 4 and 5; cilia greyish buff from vein 3 to tornus, otherwise black, tipped with greyish buff just below apex.
Expanse 15 mm.
Hab. Guapiles.

Diarhabdosia coroides, sp. n.

♂. Frons and metathorax dark grey. Vertex and collar buff-white, the latter edged behind with roseate. Mesothorax roseate, the patagia buff-white, tipped with dark grey. Abdomen whitish yellow. Fore wings dark lilacine grey; the costal margin except at base, the inner margin broadly, a streak through cell to outer margin, and cilia whitish yellow. Hind wings smoky grey; the costal, inner margin, and cilia whitish yellow. Underneath the fore wings are more fuscous grey, the streak in cell very fine and not reaching outer margin; the hind wings whitish yellow, suffused with grey at apex.
Expanse 18 mm.
♀. Similar to male, but hind wings above and below dark grey, the costal margin and cilia whitish.
Expanse 20 mm.
Hab. Guapiles, Tuis, Sixola.
Allied to *D. cora*, Dyar.

Diarhabdosia melinda, sp. n.

♂. Head whitish; a dark grey spot between antennæ. Collar whitish, edged behind with roseate. Thorax roseate. Abdomen yellowish white; a transverse dark grey line on last segment. Fore wings whitish yellow; a lilacine grey shade at end of cell, expanding towards costa, and continuing towards apex, where it is upturned and ends in a dark point on costa; a broad similar shade below cell and to outer margin, terminating in a darker point; the base of inner margin shaded with lilacine grey. Hind wings still paler; a dark terminal shade from vein 4 to apex; a dark terminal point below vein 2. Underneath whitish; the dark shades on fore wings not reaching base and more pronounced; the shade at apex of hind wings somewhat reduced.

Expanse 20 mm.

Hab. Banana River.

Allied to *D. mandana*, Dyar.

Metallosia nitens, sp. n.

♀. Head, collar, and thorax dark golden green. Abdomen black, shot with dark green terminally. Legs shaded with dark metallic green. Fore wings golden green; a fuscous streak below cell and vein 2. Hind wings black.

Expanse 17 mm.

Hab. Sixola.

Lasiocampidæ.

Lebeda angustipennis, sp. n.

♂. Head violaceous brown, thinly irrorated with ochreous-brown hairs. Collar and thorax ochreous brown, irrorated with violaceous brown. Abdomen brown, darkest dorsally, slightly tinged with violaceous. Fore wings dark violaceous brown, irrorated with ochreous-brown scales; an ochreous point at end of cell; traces of duller antemedial, medial, and postmedial shades, all very indistinct; cilia deep reddish brown. Hind wings dull dark brown, only the costal margin irrorated with ochreous brown. The fore wings long and narrow, the outer margin very oblique. Hind wings with the costal margin deeply excised.

Expanse 78 mm.

Hab. Tuis.

Metanastria rufescens, sp. n.

♂. Palpi violaceous brown, irrorated with buff above. Head and collar greyish, the base of the scales brown. Thorax and abdomen reddish brown; some greyish-buff hairs terminally on abdomen. Fore wings reddish brown, darkest medially and on outer margin; some ochreous shading at base of inner margin; a broad antemedial space crossed on either side by ochreous-buff lines and slightly irrorated with ochreous buff; a white point in cell, followed by a long fuscous shade reaching subterminal spots; the postmedial space broad, ochreous buff, crossed by two reddish-brown lines; subterminal ochreous-buff blotches spotted with black between 7 and 9 and above and below vein 2; the outer margin slightly tinged with violaceous. Hind wings reddish brown; the cilia tipped with white.

Expanse 75 mm.

Hab. Juan Vinas, Tuis.

Metanastria antonia, sp. n.

♂. Palpi violaceous brown, tipped with buff. Head, collar, and thorax light brown, the scales tipped with buff. Abdomen brown. Fore wings brown, thickly irrorated with buff; the lines buff, outwardly edged with darker brown except the medial line, which is inwardly so shaded; basal line straight at some distance from base; antemedial straight, followed in cell by a white point; medial and postmedial lines faintly curved on costa and inwardly oblique, parallel; irregular subterminal darker shadings, hardly discernible, and two black spots near tornus. Hind wings violaceous brown.

Expanse 69–74 mm.

Hab. Juan Vinas, Tuis, Cariblanco.

Metanastria tremula, sp. n.

Head and thorax brown, tinged with lilacine, the scales tipped with buff. Abdomen reddish brown. Fore wings: base to medial space brown, thickly irrorated with buff, crossed by an antemedial, finely wavy, fuscous line; medial space dark brown, narrowing on inner margin, edged by a finely dentate buff line, and containing a white point in cell; space beyond to subterminal spots rather paler than basal area and crossed by an indistinct buff line, also finely dentate, curved on costa and inwardly oblique to inner margin; an

irregular row of subterminal black spots, beyond which the outer margin is shaded with drab. Hind wings dark brown; the costal margin similar to postmedial space of fore wings; a medial and a postmedial faint buff shade.

Expanse 76 mm.

Hab. Tuis, Juan Vinas.

Metanastria vibrans, sp. n.

Palpi violaceous brown. Head, collar, and thorax brown, irrorated with whitish buff. Abdomen above brown. Fore wings brown, tinged with violaceous, the medial space darkest; the lines fine, dentate on costal margin, finely wavy across wing; the basal line remote from base, upright; the antemedial slightly oblique, incurved between vein 2 and submedian, closely followed in cell by a white point; the medial line slightly oblique, outcurved between 2 and submedian; the postmedial curved on costal margin, parallel to medial line; an irregular row of subterminal buff spots, each containing a cluster of black scales. Hind wings rich brown.

Expanse 70 mm.

Hab. El Sitio, Cariblanco.

Claphe inflata, sp. n.

♂. Body and wings buff-brown. Abdomen with violaceous-brown tufts dorsally, except on first segment; anal hairs very long, tipped with reddish brown. Fore wings: an antemedial fuscous shade on costa, crossed by an oblique pale buffish line to inner margin, where it is outcurved and upbent to vein 3, then fainter and lunular to vein 6, enclosing between vein 3 and inner margin a dark reddish-brown space, crossed by vein 2 and submedian, which are buff; medial space between the lines from vein 3 to 6 and subcostal shaded with grey and crossed on discocellular by a rather heavy dark reddish-brown streak; a subterminal series of spots, almost coalescent, and indicated by their slightly paler edging, ending above vein 8 in dark reddish-brown spots; terminal lunular whitish streaks between the veins, outwardly finely edged with darker brown. Hind wings rather darker, except on outer margin; a terminal brown line, inwardly edged with buff.

Expanse 35 mm.

Hab. Sixola.

Claphe caramina, sp. n.

Head and thorax ochreous brown; a darker tuft on metathorax. Abdomen ochreous dorsally, yellowish laterally. Fore wings: costa finely ochreous brown; anterior space above median and vein 4 smoky grey, below median and vein 4 ochreous brown, irrorated with white, chiefly on grey portion; a fine medial and postmedial brown line; a subterminal whitish line incurved between 7 and 4, where it is followed by a curved ochreous-red spot; a terminal whitish line similarly incurved, leaving a brown space on margin between 7 and 4; the veins at apex whitish; two black points on discocellular. Hind wings yellowish; a fuscous-grey geminate shade at apex.

Expanse 25 mm.

♀. Buff-brown, darkest on terminal half; subterminal line wavy, indistinct. Hind wings outwardly shaded with brown and crossed by a paler subterminal shade; other markings as in male.

Expanse 29 mm.

Hab. Juan Vinas, Tuis.

Allied to *C. ocruma*, Schs.

Ocha casada, sp. n.

♂. Head and thorax lilacine buff. Abdomen yellowish. Fore wings yellowish, shaded with lilacine buff above median to postmedial line and on outer margin; some reddish-brown shading at base; basal half of cell dark brown; a whitish basal line; an antemedial fine brown line, forming an outward curve on costal margin and below cell, inwardly angled above inner margin; two black points on discocellular; a medial line outcurved between 9 and 5, dark brown, becoming paler towards inner margin and on costa, outbent below vein 2; postmedial line close to medial to vein 6, then straighter to inner margin, pale yellow indicated by the darker shadings on either side; a dark brown shade between 5 and 6 to subterminal, and a clear yellow space above it to vein 8; subterminal outcurved below costa, inwardly shaded with brown, and dark brown between 6 and 8, irregular below 6, indicated by the lilacine buff shade it crosses; cilia with dark points between the veins. Hind wings pale yellow; three brown lines on costa towards apex.

Expanse 24 mm.

Hab. Juan Vinas, Sixola, Guapiles.

XLI.—*Descriptions of new Freshwater Fishes discovered by Dr. W. J. Ansorge in Portuguese Guinea.* By G. A. Boulenger, F.R.S.

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Representatives of the following six new species form part of a large collection made at or near Bafata by Dr. Ansorge, and sent by him to the British Museum. Some specimens are from the Geba River, others from the Culufi River, an affluent of the Geba.

Petersius septentrionalis.

Depth of body equal to length of head, $3\frac{1}{2}$ to $3\frac{3}{4}$ times in total length. Head twice as long as broad, longer than deep; lower jaw projecting slightly beyond snout; snout shorter than eye, which is $2\frac{1}{2}$ times in length of head and exceeds interorbital width; maxillary extending to below anterior border of eye; outer præmaxillary teeth 4, alternating with those of the inner row, 8 in number; 8 teeth in lower jaw. Gill-rakers moderately long, 12 on lower part of anterior arch. Dorsal II 7, originating above ventral, at equal distance from centre of eye and from root of caudal. Adipose fin very small. Anal III 13–14. Pectoral nearly as long as head, not quite reaching ventral. Caudal deeply forked. Caudal peduncle a little longer than deep. Scales 25–26 $\frac{4\frac{1}{2}}{3\frac{1}{2}}$, 1 or $1\frac{1}{2}$ between lateral line and ventral. Silvery, finely speckled with brown on the back; a blackish lateral band; fins white.

Total length 45 mm.

Several specimens from the Geba and Culufi Rivers.

The northernmost species of the genus. Distinguished from all the species with alternating præmaxillary teeth and a complete lateral line by the low number of scales in the lateral line.

Distichodus ansorgii.

Depth of body $3\frac{3}{4}$ to $4\frac{1}{3}$ times in total length, length of head $4\frac{1}{3}$ to 5 times. Head longer than deep; snout rounded, not compressed, projecting very slightly beyond mouth, shorter than eye, which is $2\frac{1}{2}$ to $2\frac{2}{3}$ times in length of head and equals interorbital width; maxillary extending to below nostrils; teeth in a single series, 20 or 22 in each jaw.

Dorsal 17–19 (4 unbranched), equally distant from occiput and from caudal, its base equal to its distance from adipose fin, which is not scaly. Anal 11–12 (3–4 unbranched), its base much shorter than that of dorsal. Pectoral about $\frac{2}{3}$ length of head. Caudal deeply forked, lobes pointed. Caudal peduncle as long as deep or a little longer than deep. Scales 55–62 $\frac{7\frac{1}{2}-8\frac{1}{2}}{7\frac{1}{2}-8\frac{1}{2}}$, $5\frac{1}{2}$–6 between lateral line and root of ventral. Yellow, speckled with brown above the lateral line, silvery white below; a more or less distinct blackish band may be present along the lateral line; dorsal and caudal fins lemon-yellow, the former with a black spot in the upper third of its anterior part.

Total length 70 mm.

Many specimens were obtained in the Geba and Culufi Rivers.

A very distinct species, the smallest and most slender of the genus, further remarkable for the absence of scales on the adipose dorsal fin.

Nannocharax ansorgii.

Depth of body $3\frac{2}{3}$ to $4\frac{1}{4}$ times in total length, length of head $3\frac{1}{4}$ to $3\frac{3}{4}$ times. Head deeper than broad; snout as long as or a little shorter than eye, which is 3 to $3\frac{1}{3}$ times in length of head and equals interorbital width. Dorsal III 9–10, originating a little in front of base of ventral, situated at equal distance from centre of eye and from root of caudal, longest ray a little shorter than head. Anal III 7–8. Pectoral $\frac{3}{4}$ to $\frac{4}{5}$ length of head, not reaching root of ventral. Caudal forked, with pointed lobes. Caudal peduncle $1\frac{1}{2}$ times as long as deep. Scales 40–45 $\frac{5\frac{1}{2}}{6-7}$, 4–$4\frac{1}{2}$ between lateral line and ventral. Back straw-yellow, with numerous fine dark longitudinal lines; a lateral series of large black spots on the lateral line, usually confluent into a broad band terminating on the caudal fin; bases of dorsal, ventral, and caudal fins pale orange.

Total length 43 mm.

Several specimens from the Geba and Culufi Rivers.

Allied to *N. tænia*, Blgr., and *N. dimidiatus*, Pellegr.

Barbus macrops.

Depth of body equal to length of head, $3\frac{1}{3}$ to $3\frac{1}{2}$ times in total length. Snout rounded, much shorter than eye, which is $2\frac{1}{2}$ to $2\frac{2}{3}$ times in length of head; interorbital width $2\frac{2}{3}$

to 3 times in length of head; mouth subinferior; lips moderately developed; two barbels on each side, anterior $\frac{1}{3}$, posterior $\frac{1}{2}$ diameter of eye. Dorsal III 8, equally distant from centre of eye and from base of caudal, border feebly concave; last simple ray not enlarged, as long as head. Anal III 5, not reaching caudal. Pectoral $\frac{3}{4}$ to $\frac{4}{5}$ length of head, not quite reaching ventral; base of latter below anterior rays of dorsal. Caudal peduncle $1\frac{1}{3}$ to $1\frac{1}{2}$ times as long as deep. Scales radiately striated, 23–25 $\frac{21}{23}$, 2–2½ between lateral line and ventral, 12 round caudal peduncle. Yellow above, silvery below, scales on back and sides finely speckled with brown, with a more or less distinct dark brown spot at the base; a black straight lateral band from the end of the snout, through the eye, to the base of the caudal; fins yellow, dorsal and caudal orange at the base; a blackish spot at the end of the longest rays of the dorsal.

Total length 65 millim.

Numerous specimens from the Geba and Culufi Rivers.

Near *B. ablabes*, Blkr. Distinguished by the much larger eye.

Synodontis ansorgii.

Depth of body 3 to $3\frac{1}{4}$ times in total length, length of head $3\frac{2}{3}$ to 4 times. Head a little longer than broad, granulate above from between the eyes; snout rounded, as long as postocular part of head; eye supero-lateral, $3\frac{1}{2}$ (young) to $4\frac{1}{2}$ times in length of head, $1\frac{1}{3}$ to $1\frac{2}{3}$ times in interorbital width; lips moderately developed; præmaxillary teeth forming a short and very broad band; movable mandibular teeth $\frac{1}{4}$ to $\frac{1}{3}$ diameter of eye, 60 to 80 (50 in young) in number. Maxillary barbel with a broad marginal membrane in its basal third, 1 to $1\frac{1}{4}$ times length of head, reaching between anterior fourth and posterior third of pectoral spine; outer mandibular barbel $1\frac{1}{2}$ to 2 times as long as inner, former with long slender branches, latter with tubercular ramifications. Gill-opening not extending downwards beyond root of pectoral spine. Occipito-nuchal shield granulate like the occiput, obtusely tectiform, $1\frac{1}{2}$ to $1\frac{2}{3}$ times as long as broad, posterior processes rounded or obliquely truncate. Humeral process much longer than broad, granulate, not keeled, obtusely pointed, extending as far or not quite so far as occipito-nuchal process. Dorsal I 7; spine nearly straight, as long as or longer than head, not serrated, terminating in a long filament. Adipose dorsal 2 to 3 times as long as deep, $2\frac{1}{3}$ to 3 times as long as its distance from rayed dorsal. Anal IV–V 7–8, rounded.

Pectoral spine as long as or slightly longer than head, strongly serrated on both sides. Ventral reaching origin of anal or a little beyond. Caudal deeply notched, upper lobe the longer. Caudal peduncle as long as deep or a little deeper than long. Dark brown above and below, head, body, and dorsal fins with numerous round black spots. Young paler brown, with larger and fewer black spots ; fins whitish, with large black spots forming cross-bars on the anal and caudal.

Total length 235 mm.

Numerous specimens from the Geba and Culufi Rivers.

This species, which may be placed near *S. nigrita*, C. & V., and *melanopterus*, Blgr., is very distinct from any previously described.

Tilapia ansorgii.

Depth of body twice in total length, length of head 3 times. Head $1\frac{3}{4}$ times as long as broad, upper profile slightly concave ; snout as long as broad, $1\frac{2}{3}$ times as long as eye in adult, as long as eye in young ; eye 3 (young) to 4 times in length of head, 1 to $1\frac{3}{4}$ times in interorbital width, equal to depth of præorbital ; mouth extending to between nostril and eye, extremity of maxillary exposed ; outer teeth in both jaws large, obtusely bilobed, 20 (young) to 38 in upper jaw, followed after a wide interspace by a few minute tricuspid teeth arranged in 2 or 3 transverse series ; 5 or 6 series of scales on the cheek, the vertical diameter of the scaly part below the eye equal to diameter of latter. Gill-rakers rather short, the larger anvil-shaped, 11 or 12 on lower part of anterior arch. Dorsal XIV–XV 14–15 ; spines increasing in length to the last, which measures $\frac{1}{2}$ to $\frac{3}{5}$ length of head ; longest soft ray $\frac{3}{4}$ to $\frac{5}{6}$ length of head. Anal III 10–11 ; third spine longest, stronger but shorter than longest dorsal. Pectoral a little shorter than head, not reaching vertical of origin of anal. Ventral produced into a long filament, reaching origin of anal or beyond. Caudal rounded, scaly all over in the adult. Caudal peduncle deeper than long. Scales not or but very feebly denticulate, 30–32 $\frac{3\frac{1}{2}-4\frac{1}{2}}{11-12}$; lat. l. $\frac{19-22}{9-13}$. Grey or brown, with seven or eight broad black vertical bars descending to the mid-ventral line, the first passing through the eye, the last on the caudal peduncle ; pectoral greyish, other fins blackish.

Total length 210 mm.

Several specimens from the Geba and Culufi Rivers.

XLII.—*Description of a new Cichlid Fish from Mashonaland.* By G. A. Boulenger, F.R.S.

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Pelmatochromis darlingi.

Depth of body equal to length of head, $2\frac{1}{5}$ times in total length. Head $2\frac{1}{3}$ times as long as broad; snout as long as broad, with slightly convex upper profile, a little longer than eye, which is $3\frac{2}{3}$ times in length of head and slightly exceeds interorbital width or least depth of præorbital; jaws equal in front; mouth extending to below anterior border of eye; 3 series of teeth in each jaw, outer rather large; 4 series of scales on the cheek, the depth of the scaly part below the eye slightly less than diameter of eye. Gill-rakers very short, 9 on lower part of anterior arch. Dorsal XV 11; spines increasing in length to the last, which measures $\frac{1}{3}$ length of head; longest soft ray $\frac{2}{3}$ length of head. Anal III 8; third spine longest, stronger but a little shorter than last dorsal. Pectoral pointed, a little shorter than head, reaching vertical of origin of anal. Ventral extending a little beyond origin of anal. Caudal rounded. Caudal peduncle a little longer than deep. Scales very feebly denticulate, $32\frac{3}{10}$; lateral lines $\frac{22}{10}$. Brownish above, whitish beneath, with seven very indistinct darker cross-bars; a dark bar below anterior third of eye; dorsal fin with round dark brown spots.

Total length 110 mm.

A single specimen from the Makabusi River (Zambesi System) near Salisbury, Mashonaland, presented to the British Museum by Mr. J. ff. Darling.

Allied to *P. welwitschii*, Blgr.

XLIII.—*Description of a new Fish of the Genus* Polypterus *from Liberia.* By G. A. Boulenger, F.R.S.

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Polypterus lowei.

Body subcylindrical. Head $1\frac{2}{3}$ to $1\frac{3}{4}$ times as long as broad, 6 times in total length, with lateral eyes and convex

interorbital region; snout projecting beyond lower jaw; eye 7 to 9 times in length of head, 2 to $2\frac{1}{2}$ times in interorbital width; head-shields all paired; suboperculum a little smaller than eye. Dorsal with VII–VIII spines, anterior widely separated when folded. Anal 12–13. Pectoral widely separated from first dorsal spine. 56–59 scales in a longitudinal series, 30–33 between occiput and first dorsal spine, 36–38 round middle of body. Dark olive above, yellow beneath, back and sides spotted or marbled with blackish; no large black spot on the muscular part of the pectoral fin.

Four specimens, measuring from 137 to 223 mm., were obtained by Mr. Willoughby P. Lowe at Nanna Kru, Liberian coast, in January 1911.

P. lowei is intermediate between *P. palmas*, Ayres (*buettikoferi*, Stdr.), and *P. retropinnis*, Vaill. It is readily distinguished from the first by the smaller eye and the higher number of scales between occiput and dorsal fin (30–33 instead of 23–26), from the second by the lower number of these scales and by the absence of a large black spot on the muscular part of the pectoral fin. Besides, the snout of this fish is broader than in either of the two species with which it should be compared.

XLIV.—*On new African* Muridæ.

By Oldfield Thomas.

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Œnomys ornatus, sp. n.

A small species, with a maximum development of the bright coloration typical of the genus.

Size only about two-thirds that of *Œ. hypoxanthus*. Fur of medium texture; hairs of back about 11 mm., the longer bristles attaining 16 mm. General style of coloration like that of *hypoxanthus*, but the yellowish and reddish markings especially bright. Upper surface of body "raw umber," paling on sides to near "tawny olive." Under surface white (to roots of hairs) on throat, chest, and inguinal region; belly washed with clear buff; a broad line of bright "buff" edging the body-colour on sides. Muzzle, including eye-rings, "tawny ochraceous." Ears deep tawny. Hands and feet tawny ochraceous; wrists, lower legs, and ankles rich buff or

ochraceous buff in continuation with the buffy line on the sides. Hairs round base of tail with bright buffy ends. Tail practically naked, dark brown, scarcely lighter below.

Skull conspicuously smaller than that of *Œ. hypoxanthus*. Cranial ridges less strongly developed. Supraorbital ridges more divergent posteriorly. Palatal foramina broad in front, strongly narrowed behind. Palate between molars very narrow. Teeth essentially as in *Œ. hypoxanthus*.

Dimensions of the type (measured in flesh) :—

Head and body 112 mm. ; tail 157 ; hind foot 29 ; ear 17.

Skull : greatest length 30·5 ; basilar length 23·6 ; greatest breadth 15·3 ; nasals 11·6 ; interorbital breadth 4·8 ; palatilar length 13 ; palatal foramina 5·1 ; breadth of palate between m^1 1·8 ; upper molar series 6·6.

Hab. Bibianaha, near Dunkwa, Gold Coast. Alt. 700′.

Type. Young adult female. B.M. no. 11. 2. 14. 9. Original number 58. Collected 12th Jan., 1911, and presented by Dr. H. G. F. Spurrell. Two young specimens also sent.

This beautiful species presents the extreme of a type of colouring found in several different parts of the world—for instance, in S. America, in *Peramys* (*scalops* &c.) and in *Akodon* (*bacchante* &c.). In Africa all the members of *Œnomys* show something of it, the different subspecies being characterized by its degree of intensity.

The young specimens of *Œ. ornatus* are even more vividly coloured than the adult, the ears especially standing out in marked contrast to the rest of the head.

As a species *Œ. ornatus* is at once separable from the Western *Œ. hypoxanthus*, and in a less degree from the Eastern *Œ. bacchante*, by its much smaller skull and teeth, though the hind foot is of nearly equal length to that of the latter.

The opposite extreme of the *Œnomys* coloration is presented by the following :—

Œnomys bacchante mœrens, subsp. n.

An *Œnomys* almost without buffy markings, the belly suffused with slaty.

Size and other essential characters as in *bacchante*. Colour throughout much darker and less ornamented. Upper surface dark, between "olive" and "bistre," the rump and legs with an almost imperceptible suffusion of clay-colour. Under surface lighter than the upper, the hairs dark slaty proximally, dull clay-colour terminally, no lateral line of

demarcation perceptible; inconspicuous patches of whitish on chin and sides of chest between fore limbs. Head rather greyer than back. Sides of muzzle suffused with dull inconspicuous tawny, barely extending back to the eyes. Ears dark brown. Hands and feet brown, not buffy. Tail dark brown, scarcely lighter below.

Skull essentially like that of *bacchante*, the bullæ a little smaller. Teeth small, as in all the Eastern forms, though still decidedly larger than in the far Western *Œ. ornatus*.

Dimensions of the type (measured in flesh) :—

Head and body 137 mm. ; tail 165 ; hind foot 31 ; ear 19·5.

Skull : greatest length 37·4 ; basilar length 29·4; palatal foramina 7 ; upper molar series 7.

Hab. Solai, western slope of Mt. Kenya, B.E.A. Alt. 8000′.

Type. Adult female. Original number 1561. Collected by Robin Kemp. Presented by C. D. Rudd, Esq. Six specimens.

This Kenya *Œnomys* differs from all the known forms of the genus by the slaty bases to its belly-hairs.

Œnomys oris, sp. n.

As in *Œ. bacchante*, but size larger.

Size about as great as in the Western *hypoxanthus*, therefore markedly larger than in *Œ. bacchante*. Colour quite as in the latter. Feet pale brown.

Skull shaped as in *Œ. bacchante*, but larger throughout. Interorbital region narrower than in *hypoxanthus*. Bullæ large.

Teeth large and heavy, quite equalling those of Cameroon examples of *Œ. hypoxanthus*.

Dimensions of the type (measured in flesh) :—

Head and body 179 mm. ; tail 184 ; hind foot 32·5 ; ear 22.

Skull : greatest length 41 ; basilar length 33 ; greatest breadth 20 ; interorbital breadth 5·3 ; breadth of brain-case 15·7 ; palatilar length 18·4 ; palatal foramina 8·2 ; upper molar series 7·8.

Hab. Mt. Kinangop, Aberdare Range, British East Africa. Alt. 11,000′.

Type. Old male. B.M. no. 10. 5. 3. 154. Original number 696. Collected 25th February, 1910, by Robin Kemp. Presented by C. D. Rudd, Esq.

The ordinary E.-African *Œ. bacchante* was found by Mr. Kemp well up on the Aberdare Range, but the subject of the present description differs from all the other specimens

from the range by its materially larger size, longer skull, and heavier teeth, in which respects it equals Cameroon specimens of *Œ. hypoxanthus*.

Lophuromys naso, sp. n.

Size and other characters of *L. nudicaudus*, Hell., but teeth peculiarly cuspidate.

External appearance about as in *L. nudicaudus*, the colour above rather paler brown and below duller (between ochraceous tawny and clay-colour). Tail rather longer.

Skull with a peculiar slender low muzzle, its upper profile flattened, even concave at a point above the front end of the palatal foramina. Anterior zygoma-root as in *L. nudicaudus*.

Incisors apparently a little more thrown forwards than in *L. nudicaudus*. Molars narrow; m^1 with the small outer accessory cusps very unusually developed, the one between the first and second laminæ about as long as it ever is in ordinary *Lophuromys*, while that between the second and third laminæ is produced into a high upstanding cusp almost rivalling in height the main outer cusp just behind it.

Dimensions of the type (measured in skin) :—

Head and body (probably shrunk) 95 mm.; tail 63; hind foot 19; ear 15.

Skull: tip of nasals to anterior corner of interparietal 24·5; nasals 11·7; interorbital breadth 6; breadth of brain-case 12·5; palatilar length 11·5; palatal foramina 5·5; upper molar series 4·7.

Hab. Gaboon.

Type. Adult. B.M. no. 7. 1. 1. 85. Tomes Collection. Obtained from Messrs. Verreaux about 1855.

The great development of the accessory cusps of m^1 and the peculiar shape of the muzzle will distinguish this species from any *Lophuromys* hitherto described.

This specimen, from Mr. Tomes's collection, belongs to a small set of skins from the Gaboon which are labelled as having been described by J. and E. Verreaux in the 'Revue et Magasin de Zoologie,' 1855, under various names, all unknown to naturalists, but apparently the paper was never published. Had it been, Peters's name *Lophuromys* for the genus would have been antedated by that proposed by the brothers Verreaux.

Thamnomys buntingi, sp. n.

A Western species of the *ibeanus* and *macmillani* group.

General external appearance as in other members of the

group, in fact quite like Elgon specimens referred to *T. ibeanus* except that the ears are smaller. Head and anterior half of body lined olive-grey, posterior half passing into dull tawny ochraceous. Under surface sharply defined pure white, a very narrow buffy edging along the posterior part of the line of demarcation. Ears rather small, coloured like the head. Hands and feet pale buffy. Tail as usual long, well-haired, and slightly pencilled terminally, brown above and at the end, inconspicuously lighter below proximally, where the hairs are dull buffy except along the centre, where they form a slightly darker median line.

Skull rather longer than that of *macmillani*, but with even smaller bullæ. Anterior palatine foramina comparatively short, not reaching back even to the level of the front of the root of m^1. Teeth very small.

Dimensions of the type (measured in the flesh):—

Head and body 108 mm.; tail 170; hind foot 23·5; ear 15.

Skull: greatest length 29·3; condylo-incisive length 27; zygomatic breadth 14·2; nasals 11; interorbital breadth 4·5; brain-case breadth 12·8; palatilar length 12; diastema 7·5; palatal foramina 6·1; upper molar series 4·3.

Hab. Gonyon, Bassa, Liberia.

Type. Old male. Original number 36. Collected 29th November, 1910, by R. H. Bunting.

This *Thamnomys* is readily distinguishable from other members of the genus by its size, small teeth, small bullæ, and short palatal foramina. It is the first of this group of *Thamnomys* to be discovered in West Africa, the previously known species ranging from Abyssinia to the Cape.

I have named it after Mr. R. H. Bunting, its captor, in whose collection there are several interesting Liberian species not previously possessed by the Museum, such as "*Mus*" *trivirgatus*, Temm., *Epimys defua*, Mill., *Dasymys rufulus*, Mill., and *Malacomys edwardsi*, Rochebr.

Typomys, gen. nov.

External characters as in *Hybomys*, except for the three-striped instead of one-striped pattern of coloration. Mammæ 0—2=4, these varying in *Hybomys* from 0—2=4 to 1—2=6.

Skull less broad than in *Hybomys*. Brain-case smaller, muzzle longer. Anterior zygoma-root with the upper bridge over the foramen, the hinder edge of the zygomatic plate, and the front half of m^1 all in one straight vertical line (in *Hybomys* the bridge is decidedly anterior to the hinder edge of

the plate, and the latter, again, is opposite the extreme front edge of m^1). Front edge of zygomatic plate slanted, little curved, not subangularly projected forward. Palatal foramina shorter, barely equalling the length of the molar series.

Molars not so simple and *Epimys*-like as in *Hybomys*, but more tending to the character of those of *Mylomys* as compared to *Pelomys* *, although not so extreme.

The middle cusp of each lamina is, as in *Mylomys*, highly developed, beak-like, directed backwards, the laminæ are similarly curved round, and complicated by the development of connecting-ridges between the laminæ, notably between the first and second laminæ of m^1.

Type. *Typomys trivirgatus* (*Mus trivirgatus*, Temm.).

The character of the molars of this animal is one common to several African genera—e. g., *Mylomys*, *Œnomys*, and *Desmomys*,—but as to whether it is an independent development in each case or shows any community of origin I am not at present prepared to express an opinion. *Hybomys*, otherwise not widely different from *Typomys*, has quite normally constructed molars.

Six specimens of *Typomys trivirgatus* were obtained by Mr. Bunting in Liberia.

XLV.—*A new Vole from Eastern Asia.*

By Oldfield Thomas.

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Microtus pelliceus, sp. n.

A large vole allied to *M. calamorum*, Thos.

Size large as compared with ordinary voles, about as in *M. calamorum*. Fur long, soft, very sleek and fine; hairs of back about 15 mm. in length, the long bristle-hairs attaining 20 mm. or more. General colour above sepia-brown, formed of mixed black and dull buffy, the resulting mixture very heavily and coarsely lined. Under surface soiled greyish white, the bases of the hairs slaty, the ends dull whitish. Ears rather short, dull greyish brown. Hands and feet brown on metapodials, whitish on digits; soles with only 5 pads. Tail long, well-haired, the hairs quite hiding the scales; sharply bicolor, deep brown above, white below.

* *Cf.* Ann. & Mag. Nat. Hist. (7) xviii. p. 224 (1906).

Skull of the same high and rather narrow shape as in *M. calamorum*; upper outline rather less bowed. Brain-case high, narrow, its anterior angles well marked. Palatal foramina of medium length, narrow. Posterior palatal pits well marked. Opening of posterior nares rounded.

Teeth in essential structure as in *M. calamorum*, but rather narrower. M^3 with four spaces and a terminal **C**, four inner and three outer angles. M_1 with six closed spaces and an anterior trefoil, five inner and three outer angles.

Dimensions of the type (measured in flesh):—

Head and body 150 mm.; tail 70; hind foot (s. u.) 23, (c. u.) 25·5.

Skull: upper length (tip of nasals to back of interparietal) 29; greatest breadth 18; nasals $9 \times 4{\cdot}1$; interorbital breadth 4; breadth of brain-case 13·3; height from alveolus of m^2 11; palatilar length 17; palatal foramina 5·6; upper molar series (crowns) 8·7.

Hab. Ussuri River, E. Siberia.

Type. Adult. B.M. no. 91. 6. 29. 2. Collected by Messrs. Dörries on November 28, 1889.

This fine vole is distinguished from *M. calamorum* by its larger size and longer fur. No other described species seems to be nearly related to it.

XLVI.—*Three new Mammals from Dutch New Guinea.*

By Oldfield Thomas.

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The collection of mammals obtained by the B.O.U. Expedition to New Guinea contains several species new to the Museum and the following three new to science. All were collected in the low country near the coast, south of the Charles Louis Range in Dutch New Guinea, and are presented to the National Museum by the Subscribers to the Expedition.

Emballonura furax, sp. n.

A very large species with greatly expanded muzzle.

Size larger than in any described species. Fur long, close, and straight; hairs of back rather over 7 mm. in length. General colour above uniform rich brown (between vandyke-brown and burnt umber), the hairs rather paler basally.

Under surface paler brown, the ends of the hairs lighter. Membranes naked throughout. Tragus of medium length, broader above than at base, its anterior and posterior margins both evenly convex, its tip rounded.

Skull of quite unusual appearance, owing to the enormous development of the muzzle, the area of the facial expansion being distinctly greater than that of the brain-case. In a general way the face is constructed as in *E. semicaudata*, but the expanded portion is produced on each side into a marked lateral projection in front of the orbits and just over m^1, while the same swelling posteriorly overhangs and almost hides from above the flat floor of the orbit. Edges of the swollen part rounded throughout. Postorbital processes small but distinct. Top of muzzle with a median groove extending back to the level of the postorbital processes, its edges smoothly rounded. Posterior palate produced some little distance behind the level of m^3, as in *E. semicaudata*.

Upper incisors subequal. Canine with a distinct posterior basal cusp. P^4 and molars large, rounded, their postero-internal lobes so developed that there are practically no gaps between them. M^3 large, rounded, its antero-posterior diameter greater than usual, about two-thirds of its transverse extent.

Dimensions of the type (the starred measurements taken in the flesh) :—

Forearm (c.) 53 mm.†

Head and body *61 ; tail *19 ; ear *19 ; third finger, metacarpus 47, first phalanx 18·5, second phalanx 22 ; lower leg and foot (c. u.) 27.

Skull : greatest length 18·7 ; basi-sinual length 14 ; zygomatic breadth 11·3 ; breadth across facial inflation 9·5 ; inter-temporal breadth 4·1 ; breadth of brain-case 9 ; palato-sinual length 7·7 ; front of canine to back of m^3 7·5 ; breadth across palate outside m^2 8·1.

Hab. Kapari River, S.W. New Guinea. Type from "Whitewater Camp." 400′.

Type. Adult female. Original number 2514. Collected by C. H. B. Grant during the B.O.U. Expedition to New Guinea. Presented by the Subscribers.

This fine species is a giant in the genus *Emballonura*, the largest previously known species, *E. semicaudata*, having a skull-length of only about 15·5 mm., while the enormous expansion of the facial region makes it quite unique in the group.

† Both forearms are broken in the type, and the above is an estimate, founded mainly on the length of the metacarpus.

Uromys naso, sp. n.

Near *U. lorentzii*, but skull longer and more compressed.

Size slightly larger than in *U. lorentzii*, the hind foot decidedly longer. Fur crisp and velvety; hairs of back between 8 and 9 mm. in length. General colour above as usual brown, becoming more rufous on rump. Under surface greyish white, the hairs slaty basally, dull greyish white terminally; line of demarcation on sides rather well defined. Head grey. Hands and feet dull whitish. Tail black, its under surface inconspicuously marked with dull whitish—equally different from the sharply bicolor tail of *lorentzii* and the wholly black one of the next species.

Skull longer and narrower than that of *U. lorentzii*, the greatest spread of the zygomata at their anterior end, instead of posteriorly. Muzzle high, narrow and compressed laterally, the nasals long and narrow. Maxillary part of zygomata broadened vertically, so that the vertical diameter, opposite the back of m^1, is nearly 3 mm., the broadest in a series of *lorentzii* being under 2 mm. Palatal foramina rather longer than in *lorentzii*. Molars comparatively narrow.

Dimensions of the type (measured in flesh):—

Head and body 188 mm.; tail 132; hind foot (s. u.) 36; ear 21.

Skull: greatest length 45·5; condylo-incisive length † 41·3; zygomatic breadth 20·2; nasals 17 × 5; interorbital breadth 7; breadth of brain-case 16·5; height of crown from alveolus of m^2 11·6; palatilar length 21; diastema 12·7; palatal foramina 7 × 3·2; upper molar series 8·6.

Hab. Kafari River, S.W. New Guinea. Type from "Whitewater Camp." Alt. 400′.

Type. Adult female. Original number 2512. Collected 19th October, 1910, by C. H. B. Grant on the B.O.U. Expedition to New Guinea. Presented by the Subscribers.

Compared with a series of skulls of what I refer to *Uromys lorentzii*, Jent., that of the present animal is at once distinguishable by its more elongate shape, compressed muzzle, and by the peculiar broadening of the maxillary part of the zygomatic arch. Externally the animals are closely similar, though *U. naso* has not the conspicuously bicolor tail of *U. lorentzii*, and its foot is longer.

† From the back of the condyle to the most anterior point on the convex front surface of the incisors. This measurement, which I have already used in the case of shrews, I believe to be a better one for rodents than any other that has been proposed.

Uromys stalkeri calidior, subsp. n.

Similar to true *stalkeri* of Eastern New Guinea in all essential characters, but fur crisper and colour darker, warmer, and more heavily ticked with black. Sides of belly edged with buffy.

Fur crisp, decidedly crisper than in the soft-haired *stalkeri*; hairs of back about 9 mm. in length. General colour above nearest to "cinnamon," that of *stalkeri* more approaching "clay-colour," the back heavily lined, owing to the black tips to the hairs. In *stalkeri* the colour is almost uniform, hardly any of the hairs having black tips. Under surface white, the white area broader than in *stalkeri*, the hairs normally white to their bases. Lower edge of flanks with a more or less distinct buffy or ochraceous-buff line, contrasting with the white of the belly, but in some specimens the buffy passes right across the belly, and in these the bases of the ventral hairs are commonly slaty. Head grey, darker than in *stalkeri*. Hands whitish generally, with a darker metacarpal patch; feet dull whitish brown. Tail wholly black.

Skull apparently as in *stalkeri*, except that the nasals project backwards slightly beyond the premaxillary process.

Dimensions of the type (measured in flesh) :—

Head and body 153 mm.; tail 156; hind foot 30; ear 17.

Skull: greatest length 33·8; condylo-incisive length 33·4; zygomatic breadth 17·7; nasals 11; interorbital breadth 6·2; palatilar length 16·2; palatal foramina 4·8; upper molar series 6·5.

Hab. Coast area of Dutch New Guinea, south of the Charles Louis Range. Type from the Mimika River. Alt. 420′. Others from the Wataikwa River.

Type. Old male. Original number 3013. Collected 30th March, 1910, by G. C. Shortridge, on the B.O.U. New Guinea Expedition. Nine adults and five young examined.

This small *Uromys* is very closely allied to the Eastern *U. stalkeri*, but appears to be separable by the colour-characters above described. Some of the specimens are in a grey phase (approaching "smoke-grey"), but these are apparently immature.

It is smaller than Dr. Jentink's *leucogaster* and larger than the same author's *sexplicatus*. Its wholly black tail forms a ready means of distinguishing it from *lorentzii* and *naso*.

XLVII.—*Note on a new Leech* (Placobdella ægyptiaca) *from Egypt.* By W. A. Harding, M.A., F.L.S.

I am indebted to Professor Jeffrey Bell * for the opportunity of examining a number of specimens of a leech ectoparasitic on the mud-tortoise (*Trionyx triunguis*), sent by Capt. Flower from Cairo, which proved to be examples of a species hitherto unrecorded. The material, which was preserved in alcohol, was unfortunately in a state most unfavourable for determination, and consequently the analysis of the annulation given below is to be considered, as far as the extremities of the body are concerned, as subject to revision. The following is a brief diagnosis of the new species, for which, as it is the first of the Glossosiphonidæ to be described from Egypt, I propose the specific name *ægyptiaca*.

Body (somewhat contracted in alcohol) ovate-oblong, flattened; the head-region not distinct; the rings smooth ventrally, and covered dorsally by numerous, low, irregularly disposed papillæ.

Colour faded in alcohol to a more or less uniform brownish grey without any trace of pattern.

The rings composing the body tend to resolve themselves into groups, separated by somewhat deep grooves, and corresponding to each segment or somite. In the middle portion of the body the first ring in each group was found to contain a ganglion of the ventral chain, and thus, in the absence of colour-markings or conspicuous papillæ, the complete somite was seen to be composed of three rings. In each complete somite the groove separating rings 2 and 3 is greater than that between rings 1 and 2, whilst that between the rings of contiguous somites is still more marked.

Rings 71 in number.

Somites v.–xxiii. complete with three rings; xxiv.–xxvii. biannulate, the first ring of xxiv. being divided at its margins.

Eyes 2, conspicuous, near together, situated on ring 3.

Anterior sucker imperforate; the *mouth* piercing its anterior lip and nearly terminal.

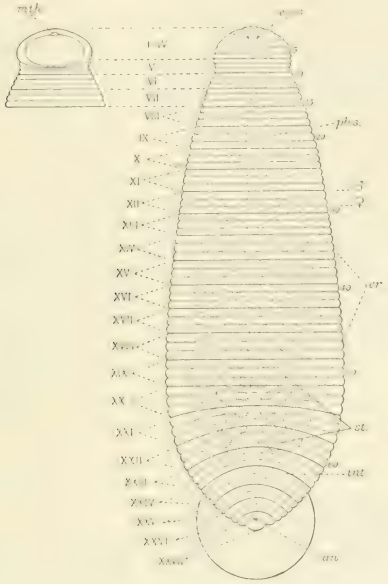
Genital apertures separated by two rings, the male orifice being situated between somites xi. and xii., the female between the first and second rings of xii.

* [On receiving the draft of this paper from Mr. Harding I suggested to him that it would be well to let me communicate with Capt. Flower before sending the paper for publication. In return Capt. Flower wrote: "Speaking from recollection, the leeches have no colour and no pattern; these are the only leeches I have ever seen in Egypt, and it is impossible to say when we can obtain more specimens. *Trionyx* is very rare in this part of Egypt." The student must therefore be satisfied with what Mr. Harding is able to tell him.—F. J. B.]

Crop with seven pairs of cæca.

Anus situated between the two rings of somite xxvii. and separated by one ring from the posterior sucker.

Size of the largest example, in a medium state of contraction, 14·5 mm. long and 5 mm. wide.



Placobdella ægyptiaca, sp. n.

Diagram showing dorsal surface, part of anterior ventral surface, annulation, digestive tract, &c. Somites indicated in Roman figures, rings numbered in italics. *mth.*, mouth; *pb.s.*, proboscis-sheath; *cr.*, crop; *st.*, stomach; *int.*, intestine; *an.*, anus.

The nearly terminal mouth, the seven pairs of crop-cæca, and the fact that its host is a tortoise place this leech beyond doubt in the Glossosiphonid genus *Placobdella* (R. Blanchard, 1893). Another small species of *Placobdella* closely resembling the one under consideration, recently sent to me from India for identification and not yet described, preys upon *Trionyx gangeticus*.

XLVIII.—*On Lamellicorn Beetles belonging to the Subfamilies* Ochodæinæ, Orphninæ, Hybosorinæ, *and* Troginæ. By Gilbert J. Arrow.

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Ochodæinæ.

The genus *Ochodæus* is evidently destined to become a very large one, especially as regards its American representatives. Nineteen species from the United States have been recently enumerated by Mr. Fall (Journ. New York Ent. Soc. xvii. 1909, p. 30), and the four from Central America and three from South America, which are all that have yet been described from that huge area, certainly give a wholly inadequate notion of those actually existing there. Owing no doubt to peculiarly retiring habits possessed by these beetles, single specimens only seem to be generally found, and those rarely. The sexes differ in the most distinctive characters, which are generally those of the male, so that the proper association of male and female is difficult. The types of all the seven species mentioned above are in the British Museum, and as the discrimination of the Central-American forms in the 'Biol. Centr.-Americana' is unsatisfactory, I have thought it desirable to draw up a table of the species, adding a few new ones, by which the total is raised to ten.

Synopsis of Central-American Species of Ochodæus.

1	(6). Apical angles of the elytra produced.	
2	(5). Pronotum closely granulated.	
3	(4). Vertex of the head bearing a transverse carina	*luridus*, Westw.
4	(3). Vertex of the head without a transverse carina	*biarmatus*, Lec.
5	(2). Pronotum distinctly punctured	*puncticollis*, sp. n.
6	(1). Apical angles of the elytra not produced.	
7	(10). Head without tubercles.	
8	(9). Head flat; clypeus not very small	*planiceps*, sp. n.
9	(8). Clypeus very small, with the margin feebly elevated at the sides and middle	*præsidii*, Bates.
10	(7). Head tuberculate.	
11	(18). Clypeus bituberculate.	
12	(13). Pronotum distinctly punctured	*pollicaris*, Bates.
13	(12). Pronotum densely granulated.	
14	(15). Elytra clothed with close decumbent setæ .	*honduræ*, sp. n.
15	(14). Elytra clothed with erect setæ.	
16	(17). Vertex bearing a slight transverse carina..	*fraterculus*, sp. n.
17	(16). Vertex without a transverse carina	*setulosus*, Bates.
18	(11). Clypeus unituberculate	*euops*, sp. n.

I have included *O. biarmatus*, Lec., among the Central-American species on the strength of a single specimen from Durango left unnamed by Bates. It is apparently a female, and I am unable to distinguish it from that sex of the North-American species.

The two Mexican specimens referred by Bates to *O. luridus*, Westw., agree exactly with the type, and are not, as he suggested, the other sex. He evidently did not recognize the two tubercles described by Westwood in the interrupted carina upon the vertex of the head. On the other hand, the Guatemalan specimen also placed here by Bates belongs to quite a different species, which, for the sake of clearness, I describe.

Ochodæus puncticollis, sp. n.

Rufo-brunneus, ovatus, sat nitidus, parce fulvo-setosus, capite grosse granulato, vertice fortiter transverse carinato, clypeo parvo, late arcuato, margine medio subtuberculato, mento parvo, lævi, subquadrato; prothorace sat fortiter, medio disperse, lateraliter crebre, punctato, marginibus lateralibus fere rectis, angulis posticis paulo rotundatis; elytris brevissime setosis, fortiter striatis, striis grosse punctatis, angulis posticis productis; tibiis anticis fortiter 3-dentatis, dente supero ab secundo parum remoto, tarsorum posticorum articulo primo quam reliquis conjunctis multo breviori.

Long. 7·5 mm.; lat. max. 4·25 mm.

Hab. Guatemala: Tepan (*Conradt*).

The single specimen is probably a female. The shining, sparsely punctured prothorax distinguishes it from most other species of the genus. The posterior angles of the elytra are distinctly dentate, the mentum is small, rather square, smooth, and very feebly impressed along the middle, the vertex bears a short but sharply elevated transverse carina, and the small clypeus bears a rudimentary tubercle (which is, perhaps, more developed in the male) at the middle of the front margin.

Ochodæus planiceps, sp. n.

Picco-rufus, capite prothoraceque paulo dilutioribus, ubique sat dense fulvo-setosus, ovatus, capite granuloso-rugoso, plano, clypeo late arcuato, mento elevato, postice polito, antice sulcato, hirto; pronoto dense et æqualiter granuloso-rugoso; elytris fortiter striato-punctatis, angulis posticis haud productis; pedibus simplicibus, haud brevibus, tibiis anticis 3-dentatis, dente supero minuto, a basi haud remoto:

♂, tibiæ anticæ apice intus acute producto.

Long. 7·5 mm.; lat. max. 4 mm.

Hab. Guatemala: San Isidro (1600 ft.).

The single specimen found by Mr. G. C. Champion was recorded, but not named, by Bates in the 'Biol. Centr.-Americana.' It resembles *O. præsidii*, Bates, being clothed like it with rather long yellow setæ, but it is much darker in colour, the head is flatter, and the legs are rather long and slender, without femoral tooth or dilated tibiæ. The head is strongly and closely granulated and very flat, without elevation of any kind.

The finger-like terminal process at the inner edge of the front tibia is absent in the male of *O. præsidii*. Although not found in several species, I believe when present this is always distinctive of the male.

Ochodæus hondurœ, sp. n.

Picco-rufus, ovalis, dense fulvo-setosus, capite lato, modice crebre punctato, medio excavato, clypeo brevissime arcuato, margine crassato, angulis basalibus utrinque tuberculatis, mento elevato, haud impresso, postice glabro, antice angustato, longe fulvo-hirto; prothorace crebre et æqualiter rugoso-punctato; elytris fortiter punctato-striatis, angulis posticis haud productis; tibiis anticis haud acute 3-dentatis, dente supero minuto, a basi haud remoto, pedibus simplicibus, tarsorum posticorum articulo primo ad reliquos conjunctos longitudine fere æquali:

♂, tibiæ anticæ apice intus producto.

Long. 8·5–9 mm.; lat. max. 5–5·5 mm.

Hab. Honduras, Mexico.

There are two male specimens in the British Museum, one of them, labelled "Mexico: Sallé Coll.," having been referred to by Bates. The second, from Honduras, agrees with it, but is less well-preserved. It is a fairly large species, with the head formed almost as in *O. biarmatus*, Lec., which is much smaller and lighter-coloured. *O. hondurœ* is dark, densely sculptured, and clothed above with fine greyish setæ, closely and uniformly disposed and lying close on the elytra. The head is strongly but not very closely punctured, hollowed in the middle, without any trace of a posterior carina, but with a rounded tubercle at each angle of the short rounded clypeus.

Ochodæus fraterculus, sp. n.

Ovalis, rufus, sat longe erecte fulvo-setosus, capite grosse granuloso, medio depresso, postice obsolete carinato, clypeo breviter arcuato, angulis basalibus utrinque tuberculatis, mento elevato, haud impresso, postice glabro, antice longe fulvo-hirto; prothorace

crebre et æqualiter rugoso-punctato; elytris fortiter punctato-striatis, angulis posticis haud productis; tibiis anticis haud acute 3-dentatis, dente supero minuto, a basi haud remoto, femoribus quatuor posterioribus apice fere dentatis, tarsorum posticorum articulo primo ad reliquos conjunctos longitudine vix æquali:
♂, tibiæ anticæ apice intus acute producto.
Long. 8 mm.; lat. max. 4·5 mm.

Hab. Costa Rica: San Francisco de Guadeloupe (3600 feet).

A single male was sent to the British Museum by the late M. Pittier de Fabrega, by whom it was taken in September 1892.

It is closely allied structurally to *O. hondurœ*. It is smaller and of a brighter red colour, and the pubescence with which it is clothed is longer and coarser and does not lie flat as in that species. The sculpture of the upper surface is almost the same, but the head is covered with large granules or rugosities and no definite punctures can be traced. There is a slight vestige of a transverse carina between the eyes.

Ochodœus euops, sp. n.

Ovalis, rufus, ubique sat longe pilosus, capite grosse granuloso, piloso, oculis prominentissimis, nitidissimis, clypeo parvo, tuberculo lato, haud acuto, bene elevato, ante marginem prædito, vertice haud carinato, mento plano, postice polito, antice fulvo-hirto; prothorace crebre sat æqualiter granuloso; elytris fortiter striato-punctatis, angulis posticis haud productis; tibiis anticis fortiter bidentatis, dente tertio minutissimo a basi haud remoto, tarsorum posticorum articulo primo quam reliquis conjunctis paulo breviori:
♂, tibiæ anticæ apice intus acute producto.
Long. 8 mm.; lat. max. 4 mm.

Hab. Mexico: Amula, Guerrero (6000 ft., *H. H. Smith*).

I have seen only the single male specimen. It is of a rather bright rusty red colour and clothed above and beneath with long erect yellow hair. The eyes are extremely prominent and very shining, the facets being only visible when highly magnified. The head is coarsely granulated and the small clypeus is almost entirely occupied by the broad shining tubercle. The species seems to be related to *O. frontalis*, Lec., but the male is without the femoral teeth characteristic of that insect and the head is quite destitute of a posterior carina.

It may be noted here that the Javan *Ochodœus maculipennis*, Arrow, is (*Scarabœus*) *xanthomelas*, Wied., which was

placed in the genus *Athyreus* in the Munich Catalogue. I have been able to compare the two types by the kindness of Dr. Adam Boving, of the Copenhagen Museum.

Orphninæ.

I have found it necessary to change the name of *Hybalus gazella*, Raffray, to *H. raffrayi*, the name *gazella* having been applied by Mulsant as long ago as 1842 to a variety of *H. dorcas*, F. (= *H. glabratus*, F.).

Mr. H. Maxwell Lefroy has sent me specimens from the Punjab of a very remarkable little beetle which I have recognized as belonging to the genus *Dynamopus* of Semenow, and apparently to the same species as that described by him from Turkestan (*Dynamopus athleta*, Sem.). The author, however, has not correctly described the structure of the head and mouth-parts, having evidently not dissected the latter. The mandibles are not, as he supposed, concealed, but very prominent, as in the whole of the beetles of the present group of subfamilies; but, quite unlike any other beetle known to me, *Dynamopus* has the mandibles firmly consolidated with the sides of the head, where they form the lateral processes described by Semenow. So extraordinary is this fixation that without dissection it was an almost inevitable assumption that these processes were mere outgrowths and that the true mandibles were hidden within the mouth; but, having carefully removed all the mouth-appendages from one of the two specimens sent to me, this is conclusively disproved. The fixed mandibles have a slight upward curvature and are blunt and without teeth. Although their original function is obviously lost, it must be supposed that they have acquired some other use, for they appear to have undergone no diminution.

I have transferred the genus to the Orphninæ, to which its characters point rather than to the Hybosorinæ. The maxillæ are very well developed, with a long but not corneous outer lobe, and the inner lobe highly chitinized and armed with very strong and sharp teeth. The labium is soft, with a bilobed ligula; the labrum rather fleshy, prominent, bilobed, and studded with very strong bristles. The antennal club is not telescopic, as in the Hybosorinæ, but there appears to be no coxal stridulating-organ, a feature of most of the Orphninæ. The remarkable fimbriate spurs of the middle and hind tibiæ seem to indicate a relationship with the Ochodæinæ, in which

one of the spurs (and occasionally two) has a similar structure. The front tibial spur is not absent, as stated by Mr. Semenow, but is slender and inconspicuous.

Herr Carl Felsche has sent me a pair of a new and peculiar insect of this subfamily for which it seems necessary to form a new genus. It is an *Orphnus* with certain peculiarities which separate it sharply from all others. Chief of these is the shape of the mandibles, which have an abrupt lateral angulation and are nearly straight in front and at the side, whereas in *Orphnus* they are always regularly rounded externally. The transverse carina upon the head of the female is also characteristic, as is the form of the thorax of the male. This is formed very much as in many small species of *Copris*. It is not excavated in the middle, but very convex, armed with four conical processes and almost vertically truncated in front.

I propose to call the genus

Goniorphnus, gen. nov.

Corpus crassum, convexum. Mandibula extus rectangula lateraliter et antice fere recta, angulo sat acuto, paulo recurvo. Clypeus brevis, late arcuatus, lateribus obtuse angulatis, paulo recurvatis.
♂, clypeus antice cornu gracili, marginali armatus; pronotum antice truncatum, haud excavatum.
♀, clypeus muticus, a fronte carina lata, acute elevata, divisus.
Alia ut in genere *Orphno*.

Goniorphnus felschei, sp. n.

Niger vel nigro-piceus, nitidus, convexus, latus; prothorace toto marginato, utrinque grosse sat parce punctato; elytris lævibus, disco leviter sulcato, sulcis haud profunde irregulariter annulato-punctatis, extus irregulariter fere rugose punctatis; tibiis anticis fortiter tridentatis:
♂, capite impunctato, margine antico cornu gracili erecto paulo deplanato, haud acuminato, munito; prothorace politissimo, lateribus grosse punctatis, dorso convexo, dentibus 4 validis, conicis, fere æquidistantibus, oblique antrorsum directis, serie transverso munito, antice medio fere perpendiculariter retuso, utrinque paulo excavato:
♀, clypeo indistincte punctulato, a fronte carina lata paulo arcuata divisa, vertice sat crebre transverse punctato; prothorace subtiliter punctulato, punctis majoribus lateralibus nonnullisque medianis sparsuto.
Long. 10–11·5 mm.; lat. max. 5–6 mm.

Hab. French Congo: Kuilu (*Mocquerys*, 1892).

Hybosorinæ.

In a recent paper I referred to the genus *Dicræodon* an unnamed insect from Guatemala placed by H. W. Bates in *Ceelodes*. Having since seen two further specimens from Herr C. Felsche's collection, I take this opportunity of describing the species.

Dicræodon punctatum, sp. n.

Testaceus, capite, prothorace scutelloque interdum obscurioribus; capite parce irregulariter punctato; prothorace sat grosse irregulariter punctato, valde transverso, fere semicirculari, lateribus valde arcuatis, angulis posticis distinctis, obtusis; scutello antice punctato, postice lævi; elytris grosse seriato-punctatis, serie juxta-suturali impresso, reliquis vix impressis, marginibus externis antice parce sed longissime ciliatis, apicibus excisis, biangulatis; tibiis anticis longe bidentatis, denteque tertio brevissimo obtuso, tibiis posticis apice dilatatis, tarsis quam tibiis haud longioribus, pedum posticorum calcare superiore longo, valde inquinato; mandibulis dente acuto apicali alteroque minus acuto pone apicem munitis.
Long. 4 mm.; lat. max. 2 mm.

Hab. Guatemala: Zapote (*G. C. Champion*); Colombia: Cali (*W. F. Rosenberg*).

The three specimens I have examined appear to be females, as they agree in the form of the mandibles, the dilated hind tibiæ, short tarsi, and very long elytral fringe with the female of *Dicræodon* (*Aporolaus*) *fimbriatus*, Bates. It is a much smaller species, of nearly the same size as *D. basalis*, Westw. It differs from both in the much larger punctures of the elytra, arranged in rows which are only half as numerous. The strong hooked spurs of the hind legs are very remarkable.

In the paper referred to above I remarked that the genus *Hapalonychus* was exceptional in being apparently confined to the West-Indian islands. The species here described dissipates that idea, having the unexpected habitat of Paraguay.

Hapalonychus pusillus, sp. n.

Niger, nitidus, sat elongatus, prothoracis et elytrorum marginibus externis longe ciliatis; capite paulo impresso, grosse punctato, labro angusto, elliptico; prothorace valde transverso, fortiter irregulariter punctato, lateribus antice valde contractis, postice

arcuatis, basi lævissime sinuato ; elytris crebre seriato-punctatis, interstitiis minute irregulariter punctulatis :

♂, antennarum clava elongata, tibiis anticis longe bidentatis, tarsis anticis gracilibus, posterioribus brevibus et crassis, pedum omnium articulo ultimo magno, unguibus longis, medio fissis.

Long. 5 mm.; lat. max. 2·5 mm.

Hab. Paraguay (*Dr. Bohls*).

I have seen only two male examples of this interesting species, the type of which has been kindly presented to the British Museum by Herr Carl Felsche. Although agreeing in its essential generic characters with the two other species of *Hapalonychus*, it is very different in appearance. It is much smaller, black, and much more coarsely and irregularly punctured.

Troginæ.

I have found that the species described by me in 1903 as *Clœotus acutipes* is *C. nitens*, Guér., which therefore ranges from Mexico to South Brazil. It is probably also *nigerrimus*, Bl.

Clœotus puncticollis, Har., must be renamed in consequence of that name having been previously applied by Erichson to *C. globosus*, Say. It may be called *C. haroldi*.

XLIX.—*On* Gammarus campylops, *Leach*.

By Alfred O. Walker, F.L.S., F.Z.S.

There has been an extraordinary amount of confusion in regard to this Amphipod. To begin with the name : it first appeared in the 'Edinburgh Encyclopædia,' Article "Crustaceology," vol. vii. 1813, under the meaningless name *camylops*—no doubt a printer's error: in the appendix to the same article (1814?) it appears as *camylosps*. It is next to be found in Dr. Leach's "Arrangement of the Crustacea, &c." in the 'Transactions of the Linnean Society of London,' vol. xi. (1815) p. 360, as *campylops*, from the Greek *kampulos*, crooked, and *ops*, eye—a perfectly appropriate name. And here I may be permitted to say, with all due respect to the law of priority, that when the first name published is obviously an error, shortly afterwards corrected by the author, it is surely better to adopt the corrected form. The correct name is used by Desmarest in 1825, by Milne-Edwards in 1840, and A. White in 1847 (List Crust. Brit. Mus. p. 88), but the last-named author in the same List,

published 1830, follows Samouelle's 'Entomologist's Useful Compendium' in calling it *camptolops*. Milne-Edwards, in Ann. Sci. Nat. vol. xx. (1830) p. 367, has *camphylops*. Its next appearance of any importance is in Spence Bate's 'Catalogue of Amphipodous Crustacea in the Brit. Mus.' (1862) as *camptolops*, but the same author in 1863 (Bate & Westwood, 'Brit. Sess.-eyed Crust.') calls it *campylops*, at which it remained till the revival of *camylops* in 'Das Tierreich' (1906).

The confusion in regard to the description of the animal has been even greater, and for this Leach himself was largely responsible. His first notice gives practically no description by which the species could be recognized, except the S-like eyes. In the Trans. Linn. Soc. *l. c.* he divides the genus *Gammarus* as follows:—

A. Cauda stylis geminatis superioribus stylo supero brevissimo (*i. e.* Upper, or inner, ramus of the third uropods very short).

Spec. 1. Gammarus aquaticus.

Gammarus pulex, Leach, Edin. Encycl. vii. 402–32.

Habitat in rivulis et stagnis vulgatissima.

Spec. 2. Gammarus marinus.

Habitat in Danmoniae australis mari.

B. Cauda stylis geminatis superioribus stylis subæqualibus (*i. e.* Rami of the third uropods subequal).

Spec. 3. Gammarus Locusta.

G. oculis lunatis.

Cancer Gammarus Locusta, Montagu, Linn. Trans. ix. 92.

Habitat in Britanniae mari vulgatissime.

Spec. 4. Gammarus campylops.

G. oculis flexuosis.

Gammarus campylops (sic), Leach, Edin. Encycl. vii. 403.

Habitat in mari prope Loch-Ranza in Arran Insula.

There is clearly something wrong here: *G. aquaticus* (now called *G. pulex*), which, as the common freshwater species, cannot be mistaken, has the rami of the third uropods at least as nearly equal as *G. locusta*, yet is bracketed with *G. marinus*, which has the upper or inner ramus less than half as long as the lower or outer and is therefore rightly placed in the first group. As *G. locusta* is correctly placed in the second group, it follows that, in all probability, *G. pulex* and *G. campylops* have been transposed and that the latter has the inner ramus very short.

Fortunately Leach's original specimens (2) from the Isle

of Arran are still preserved, in excellent condition, in the British Museum, and, with Dr. W. T. Calman's kind assistance, I was recently able to examine them. The third uropods are very plainly to be seen, and, as might be expected from the above statement, the inner ramus is as short as in *G. marinus*. In fact, and in the opinion of both Dr. Calman and myself, they are only distinguishable from *G. marinus* by the S-shaped eyes. This is hardly enough to constitute a distinct species—indeed, Spence Bate (Cat. Amph. Crust. p. 209) says it "is a feature by no means to be depended upon as a specific character. Among a considerable number sent to me by Mr. Barlee (from the Shetlands) the eyes were as frequently, if not more often, of a linear form." He figures the third uropod correctly both in the above work and in the Brit. Sess.-eyed Crust. p. 375, showing the inner ramus less than half the length of the outer, yet concludes his remarks in the latter work by saying that he considers *G. campylops* to be identical with *G. locusta* (Lin.) of Liljeborg ('Öfversigt . . . . af slägtet Gammarus,' p. 448), in which the inner ramus is described as about two-thirds of the length of the outer! The antennal characters are not of much importance, and it is impossible to resist the conclusion that *G. campylops*, Leach, is merely a variety of *G. marinus*, Leach.

It follows from the above that *G. campylops*, Leach, of G. O. Sars ('Amphipoda of Norway,' p. 500, pl. 176. fig. 2), is not that species. In addition to the character of the third uropods, the type specimens are very much larger—about 12 mm. Prof. Sars was probably misled by Leach's mistake, and there is little doubt that his *G. campylops* is a young *G. locusta*. In a specimen of the latter, from a gathering of all ages examined by me, of the same size as Sars's *campylops* (6 mm.), the lateral angles of the head are almost rounded and the telson is armed with a single lateral spine (both unlike the adult), exactly as shown in his invariably accurate figures.

I have to thank Dr. Calman for much valuable assistance in the above.

L.—*A new African* Corethra.

By Fred. V. Theobald, M.A., F.E.S., &c.

Corethra pallidipes, sp. n.

Head almost black, rostrum and palpi dark brown. Thorax rich deep brown, pleuræ ochreous and ochreous brown.

Abdomen greyish brown, with dark apical borders to the segments and pale hairs. Legs unbanded, pale ochreous, semitransparent, hairs pale. Wings pale ochreous, rather pointed at the tip.

♀. Head black, with a few brown hairs; proboscis deep brown, acuminate, short, with numerous brown hairs, longest at the base and tufted apically; palpi deep brown, with brown hairs and some showing paler reflections; antennæ brown, with dark basal segment and with pale hairs.

Thorax deep rich brown, with long pale hairs, a median line and a somewhat darker area on each side of it in front; prothoracic lobes very dark brown, with long pale golden-brown hairs; scutellum dark brown, almost black in some lights, with brown hairs with dull golden-brown reflections; metanotum deep brown; pleuræ ochreous with darker markings.

Abdomen brown with a greyish sheen, the apical borders of the segments dark, the segments spotted with small round darker brown spots, each with a dark central spot from which arises a brown hair with paler reflections apically.

Legs uniformly pale ochreous, with pale hairs which are dense; the ungues equal, simple, dark brown, and rather straight. The legs look semitransparent in some lights.

Wings pale ochreous to pale brown, varying in colour in different lights, also the hairs; first submarginal cell much longer and slightly narrower than the second posterior cell, somewhat contracted near the apex, its base nearer the base of the wing than the second posterior cell, its stem less than one-third the length of the cell; stem of the second posterior about one and two-thirds the length of the cell; posterior cross-vein not quite its own length distant from the mid cross-vein.

Halteres pallid.

Length 3·5 mm.

Hab. Kampala Swamp, Uganda.

Time of capture. 25. xi. 1909.

Observations. Described from a single female. It differs from the other African species so far described (*C. ceratopagones,* Theobald) in the pale unbanded legs and dark thorax.

This specimen was included in a collection of Culicidæ made by Mr. Fraser, R.A.M.C., and Dr. C. J. Baker, M.O., of Kampala, Uganda.

Type in the British Museum (Nat. Hist.).

LI.—*A Revision of "A Survey of the Species and Varieties of* Pupa, *Draparnaud* (Jaminia, *Risso*), *occurring in South Africa," by James Cosmo Melvill, M.A., F.L.S., and John Henry Ponsonby, F.Z.S.** By Henry C. Burnup.

[Plate X.]

As there are no greater authorities on the South-African molluscan fauna than the authors of the paper under review, it is only after long hesitation that I have ventured on my present task.

The Survey having been largely based upon notes of mine comprised in a lengthy correspondence, and many of the passages therein which appear to require correction or further elucidation having been written in consequence of the authors having misunderstood certain parts of those notes, I feel justified in here offering opinions in opposition to the published views of these eminent writers.

The meaning of many sentences in their paper was distorted or rendered obscure through an unfortunate succession of printer's errors, only a few of which were emended in the "Errata" to the volume. In some few instances opinions were expressed as being mine, which, in fact, were not mine, though they were probably arrived at through the study of my initial work.

Thus, the consignment of so many species to the synonymy of *P. fontana*, Krs., was not prompted by me, as would appear to be the case from the text. Neither do I concur in the view that *P. intradentata*, Burnup, is a variety of *P. dysorata*, M. & P.

Among the printer's errors the most unfortunate is the rendering of the word *labrum* (outer lip) into *labium* (inner lip) in nearly every instance in which it was used in the MS., so completely altering the meaning.

This and a few other misrenderings have necessitated the publication of amended descriptions of the species affected, in the following pages.

Since the publication of the paper under discussion the kindness of friends and correspondents, especially Messrs. Ponsonby, Farquhar, and Tomlin, Dr. Sturany, and Major Connolly, has enabled me to study certain forms, specimens of which were unobtainable before, to describe two new varieties, add a few notes on matters not referred to in Melvill and Ponsonby's paper, and offer some new figures.

* Ann. & Mag. Nat. Hist. ser. 8, vol. i. (1908) pp. 70-86, pls. i. & ii.

I am particularly indebted to Mr. Ponsonby for the patient care with which he, during a recent visit to South Africa, discussed the Survey with me, and encouraged me to publish the emendments and additions to be found in the present revision.

Although Mr. Woodward's arguments in favour of the supercession of the name *Pupa*, Drap., by *Jaminia*, Risso *, seem to me quite convincing, I have in the following notes and descriptions, for the sake of convenience in reference, adhered as far as possible to Melvill and Ponsonby's nomenclature.

1. *Pupa crawfordiana* (M. & P.).
(Pl. X. figs. 1, 2.)

Melvill and Ponsonby say of this species: "Allied to *P. layardi*, Bens."; but it is easily distinguishable by its stouter form, less ventricose whorls, shallower sutures, more regularly conical spire, less mammillated apex, rather smoother surface, less effuse peristome, and by the absence of the seventh, minute, plait to be seen, in *P. layardi*, at the junction of the parietal wall with the columella. The arrangement of the other peristomatal processes is practically identical in both species.

The original figure is defective in form and deficient in detail, so I herewith offer new figures drawn from the co-type in Mr. Ponsonby's collection, kindly lent to me for the purpose. Mr. Ponsonby has compared my figures with the type in the British Museum, and finds that they correspond accurately, except that the *callus* in the type is not chipped as in the co-type, so verifying that part of the original description recording the peristome as continuous. Of the co-type it would be more accurate to say that the ends of the peristome converge and are connected by a callus. A comparison of fig. 2 with fig. 4 well illustrates the difference in profuseness of peristome.

Dimensions of co-type :—Alt. 6·96, lat. 3·38 mm.

2. *Pupa cryptoplax*, M. & P.

The specimen figured in the Survey measures as follows :—
Height 3·36, width 1·95 mm.
The dimensions of other specimens measured are :—
Height 3·76, width 2·15 mm.
„ 3·36, „ 2·15 „
„ 3·12, „ 2·00 „

* B. B. Woodward, Journ. of Conch. vol. x. (1903) pp. 358–361.

3. *Pupa dadion*, Bens.

This species is ovoviviparous.

Further localities :—Karkloof, Nottingham Road, and Inhluzani Mountain, Natal.

4. *Pupa damarica*, Ancey.

1888. *Pupa damarica*, Ancey, Le Naturaliste, p. 200.
1892. *Pupa ovampoensis*, M. & P. Ann. & Mag. Nat. Hist. ser. 6, vol. ix. p. 91, pl. vi. fig. 11.
1901. *Pupa ridibunda*, M. & P. Ann. & Mag. Nat. Hist. ser. 7, vol. viii. p. 320, pl. ii. fig. 11.
1908. *Pupa ovampoensis*, M. & P. Ann. & Mag. Nat. Hist. ser. 8, vol. i. p. 79, pl. ii. fig. 16.
1910. *Leucochilus damaricum* (Anc.), Bttg. Abhandl. d. Senckenb. naturf. Gesell. Bd. xxxii. p. 446.

There seems little, if any, reason to doubt the justice of Bœttger's discrimination in placing *P. ovampoensis*, M. & P., in the synonymy of this species, as Ancey's description conveys a faithful image of the shell known to South-African collectors as *P. ovampoensis*; but it must not be lost sight of that 1⅛ mm., Ancey's width dimension, seems excessive, 1 mm. being the greatest width that I have observed with a height corresponding to that of Ancey's type, though in one very large specimen in my collection from Johannesburg (*McBean*), whose height is 2·5 mm., the width almost equals Ancey's measurement, being 1·11 mm.

The figure chosen by Melv. & Pons. to represent their species in the Survey is that of the lirate var. from Rustenberg (*McBean*), which shows more sculpture than the normal form, but agrees in other respects. The shell figured measures 2·25 mm. high and 1 mm. wide.

5. *Pupa dysorata*, M. & P.

The emended description given in the Survey has become somewhat involved, owing apparently to two causes, viz., firstly, to the authors having included *intradentata* as a var. of this species (with which I cannot agree) and their desire to differentiate the typical form, in its description, from its supposed var.; and, secondly, to their having misunderstood the position of the "deep-seated postlabial* tooth" of *intradentata*, treating it as a columellar process instead of one situate "in the gullet." In addition to this, my measurement of the type, kindly lent to me by Mr. E. R. Sykes, is

* Perhaps the common expression "labial," used to express pertaining to *any* part of the peristome or lip, is confusing, and *labral* would be better when the position wished to be indicated pertains to the labrum.

misquoted. It therefore seems desirable to substitute the following description :—

Shell minute, umbilicate, shortly cylindrical, thin, shining, horn-coloured ; spire cylindrical, being almost equally wide at the third, fourth, and fifth whorls ; sutures impressed, apex rounded ; whorls about $5\frac{1}{2}$, convex, deeply closely transversely striate, excepting the apical whorls, which are smooth, the last rounded below and compressed about the umbilicus ; aperture erect, somewhat quadrate, rounded above and below, exceeding $\frac{1}{3}$ the height of the shell. Peristome slightly thickened and expanded, widely so at the columellar margin (which in the type is longitudinally chipped), paler than the rest of the shell, with labrum slightly bent inwards about the middle and columella nearly straight. There are no apertural processes.

Height 1·57, width 0·9 mm. (type in Coll. E. R. Sykes).

Hab. Griqualand East.

In the very large series of shells from divers localities in South Africa that I was privileged to examine no duplicate of this unique specimen, with its very distinctive characters, could be identified.

6. *Pupa farquhari*, M. & P.

The dimensions of the shell figured in Melvill and Ponsonby's paper are :—

Height 4·24, width 2·07 mm.

7. *Pupa fontana*, Krauss.

Of the eight forms consigned to the synonymy, I have seen well-authenticated specimens of four only, viz. *amphodon*, *elizabethensis*, *endoplax*, and *frustillum* ; and I agree with the authors that these names cannot stand. Of the remaining four, viz. *charybdica*, *custodita*, *kercea*, and *omicronaria*, having seen no representatives, I can offer no opinion ; but I am prepared to accept their views.

On p. 75 of the Survey, 10th line from the bottom, the substitution of the word *labium* for *labrum* destroys the meaning of the sentence.

The following localities may now be added :—

Edendale, near Maritzburg, and at the mouth of the Tongaat River on the Natal coast.

Boettger (1910) places this species, with *P. tetrodus*, Bttg., in *Pupilla* (see note at foot of p. 411).

8. *Pupa griqualandica*, M. & P.

This species must be closely akin to *P. bisulcata*, Jick., from Abyssinia, judging alone from description and figure, for I have not been able to examine the type or authenticated specimens of Jickeli's species. Mr. Ponsonby has, however, very kindly examined for me the specimens in the British Museum bearing that name, in conjunction with specimens of *griqualandica*, and, while finding them "very similar," pronounced them to be "at once separable," basing the separation apparently mainly upon the presence of "*a large prominent tooth on the outer lip*" of *bisulcata*. This tooth or plait, if not so large, is also present in *griqualandica*, though, perhaps through being in shadow, is not so conspicuous in the figures chosen by Melvill and Ponsonby to illustrate their species as in Jickeli's figure. No mention is made in Melvill and Ponsonby's description of the two *sulci* on the outer lip (corresponding with the labral plaits) to be discerned in *griqualandica* as represented in the figure of *bisulcata*. On the other hand, Jickeli does not record the presence of the sixth, minute, internal basal plait "visible in some specimens," which appears to me to be a constant character of *griqualandica*, though it is easily overlooked owing to its extreme smallness and internal position. The dimensions given by Jickeli represent a considerably larger and comparatively narrower shell than *griqualandica*, but, as they do not correspond with the proportions of his figure, one or other must be wrong—so neither is reliable. If his figure actually represents a shell of 1¾ mm. in height, its width is 1·27 instead of 1 mm. as he states.

The dimensions of the shells figured in Melvill and Ponsonby's paper are as follows :—

Fig. 8. Height 1·52, width 0·89 mm.
Fig. 9. „ 1·41, „ 0·83 „

The average of twenty-one specimens measured by me is :—Height 1·53, width 0·87 mm., the largest being height 1·6, width 0·99 mm.

The following new localities may be added :—Edendale Falls, near Maritzburg, and mouth of Tongaat River, Natal coast.

9. *Pupa haploa*, M. & P.

10. *Pupa intradentata*, Burnup.

1908. *Pupa dysorata*, M. & P., var. *intradenta*, Burnup, M. & P. Ann. & Mag. Nat. Hist. ser. 8, vol. i. p. 73, pl. i. figs. 5, 6.

Typographical errors in the original render a new description necessary.

Shell minute, rimate, subcylindrical, elliptical, thin, translucent, shining, very pale brown; spire elongate-turbinate, with greatest width at the fourth whorl; sutures rather deeply impressed, apex very obtuse; whorls $5\frac{1}{2}$, very convex, closely transversely striate, excepting the first $1\frac{1}{2}$, which are smooth, the last compressed round the umbilical region; aperture nearly erect, rounded, nearly $\frac{1}{3}$ the height of the shell. Peristome slightly thickened and reflexed, more so at the columellar margin, scarcely paler than the rest of the shell, with labrum slightly straightened about the middle and much receding towards the base; columella arcuate. The only tooth, conspicuous, white, rounded, and remote, is situate inside, about midway between the last suture and the base and about half a turn from the labrum.

Height 1·47, width 0·79 [fig. 5 (Survey)].
„ 1·33, „ 0·78 [fig. 6 („)].

Hab. Pretoria (*Farquhar & Ponsonby*). Major Connolly has since supplied me with many specimens, quite agreeing with the type, from the same locality.

The following are the dimensions of the largest and smallest adult specimens measured :—

Largest: height 1·51, width 0·80.
Smallest: „ 1·32, „ 0·75.

This is the smallest of the South-African group examined by me, and is of a paler colour than most. As compared with *P. perplexa*, which seems to be its nearest ally, it is smaller, smoother, paler, and less cylindrical, is only rimate instead of umbilicate, has the peristome less reflexed, and is destitute of the postcolumellar and parietal plaits. As compared with *dysorata*, of which *intradentata* appears in the Survey as a variety, it is smaller, more slender, paler, less cylindrical, more loosely coiled, with more ventricose whorls and deeper sutures, and is rimate instead of umbilicate; the aperture is smaller and rounder, receding more at the base, and is furnished with a tooth in the gullet, not found in *dysorata*.

I am indebted to Mr. Ponsonby for making a careful comparison between Mr. Sykes's type of *dysorata* and the type of *intradentata* in the British Museum, when he was able to confirm most of the details given above.

11. *Pupa iota*, M. & P.

If the word *labrum* be read instead of "*labium*" in each

case where the latter occurs, the description in the Survey seems sufficiently to describe the species.

The dimensions of the shell depicted in the figure are:—Height 2·06, width 0·87 mm.; the smallest apparently mature specimen that I have measured being 1·67 high and 0·81 mm. wide, and having only about 6½ whorls.

Var. *livingstonæ*, Burnup.

A new locality may be recorded for both the typical form and the var., viz. Stander's Kop, Transvaal (*Connolly*).

The type of the var., said to be in my collection, has since been transferred to the British Museum with the types of the other new forms described in the Survey. Its dimensions are:—Height 2·02, width 0·84 mm.

12. *Pupa layardi*, Benson. (Pl. X. figs. 3, 4.)

The fig. presented by Melv. & Pons. does not express the detail with sufficient accuracy for the purposes of comparison; I therefore take this opportunity of offering new figures for comparison with those of ?*layardi*, var. *minor*, Bens. (?= *P. stoaphora*, Bens.), and *P. crawfordiana* (M. & P.) on same plate.

The shells chosen for my illustrations do not include that figured by Melvill and Ponsonby, though Mr. Ponsonby kindly laid his shell at my disposal for the purpose. They are chosen from a series collected at Hermanus, Caledon Division, in the Cape Province, by Mr. R. M. Lightfoot, as being fresher shells than his, free from extraneous matter in the aperture, and more nearly approaching the size and proportions of Benson's type. In all essential characters they agree closely with the shells given to Mr. Ponsonby by Mr. Benson.

Since the peristome is not at all thickened at the edge, but, on the contrary, is remarkably thin and brittle, the lips are invariably more or less chipped. One of the most conspicuous differences between the present species and *P. crawfordiana*, M. & P., is the absence from the latter of the trumpet-like extension of the peristome observable in the former.

The dimensions of the specimens here figured are as follows:—

Fig. 3. Height 7·87, width 3·26 mm.
Fig. 4. „ 7·87, „ 3·67 „

The shells of this species may be either white or horn-colour, and the position of the seventh peristomatal process,

the denticle between the inferior parietal and the columellar plait, is very variable ; it is sometimes seen on the parietal wall, sometimes on the columella, and sometimes in the angle between.

Var. *minor*, Bens.? (Pl. X. figs. 5, 6.)

I also take this opportunity of offering figures of two shells in the collection of Mr. Ponsonby given to him by Mr. Benson as representing his species *P. stoaphora*. They agree in all essentials with *P. layardi*, Bens., except in their smaller size and darker colour (the larger specimen is chestnut-brown, the smaller rather paler).

The following are the dimensions :—

Fig. 5. Height 6·88, width 3·07 mm.

Fig. 6. ,, 5·67, ,, 2·75 ,,

The figures are given as a contribution towards answers to Melvill and Ponsonby's questions, "What is *P. stoaphora*, Bens.?" and "Can this be a synonym of the var. *minor*?" Since the shells given out by the author as *P. stoaphora*, Bens., seem to agree so closely with the description of his *P. layardi*, var. *minor*, and since neither Messrs. Melvill and Ponsonby nor Dr. Sturany can trace the debatable species, it seems reasonable to infer that Benson changed its name to var. *minor* before publication of his differentiation.

13. *Pupa noltei*, Bttg.

Bœttger * places this species in *Leucochiloides* (*Microstele*).

14. *Pupa perplexa*, Burnup.

Excepting that the word *labrum* is printed "*labium*," the description in the Survey appears as it was written. As, however, it contains certain ambiguous expressions, I emend it as follows :—

Shell very small, umbilicate, cylindrical, thin, translucent, shining, pale brown ; spire cylindrical, rounded above, sutures impressed, apex obtuse ; whorls 6, very convex, closely transversely lirate, except the first two which are smooth, the shell at the fourth, fifth, and sixth whorls of nearly equal width, the last half-whorl acquiring its greatest expansion a little below the suture and then being flattened beneath, forming an infrasutural angle, the last whorl compressed towards the umbilicus; aperture rounded, nearly $\frac{1}{3}$ the height of the shell; peristome whitish, reflexed, especially

* Abhandl. d. Senckenb. naturf. Gesell. Bd. xxxii. (1910) p. 445.

at the columellar margin, thickened, the ends converging and connected by a thin callus; labrum slightly incurved about the middle; columella straight. The processes of the aperture consist of a small white parietal plait running inwards and there becoming strong, a stout white post-columellar plait also running inwards, and a profoundly post-labral tooth or plait hidden by the columella.

The following are the dimensions of the shell figured in the Survey:—

Fig. 17. Type: height 1·72, width 0·82 mm.
„ 18 (sectional). „ 1·80, „ 0·77 „

Twenty-four out of twenty-six specimens measured by me show very little variation in dimensions, the remaining two, both apparently mature, being somewhat more divergent, viz.:—

Largest: height 1·88, width 0·83 mm.
Smallest: „ 1·50, „ 0·77 „

Bloemfontein (*Connolly*) may now be added to the localities quoted by Melv. & Pons.

Judging by the descriptions and figures alone, for I have not seen Jickeli's species, this shell must be akin to his *P. lardea*, *schilleri*, and *similis* from Upper Nubia*, whose apertural processes seem arranged much on the same plan, its nearest ally being the last named; *similis* is, however, about one-fourth wider than the present species and has half a whorl less, while the peristome is less expanded and the labrum less bowed inwards, and there is no callus. *P. lardea* and *schilleri* are more divergent, being not so high as *similis* and broader in proportion.

15. *Pupa pretoriensis*, M. & P.

16. *Pupa psichion*, M. & P.

I have not seen specimens that could be referred to either of the above two species in the very large series of shells from Pretoria that I have been fortunate enough to have laid at my disposal for examination, though the number, since my first study of the group, has been greatly augmented by the collections of Major Connolly.

17. *Pupa quantula*, M. & P.

The co-type in Mr. Ponsonby's collection, figured in the

* Jick. Faun. L. u. Süssw. Moll. N.O.-Af. (1874) pp. 124, 125, 296, pl. v. figs. 14–16.

Survey, is the only specimen of this species that I have seen. Its nearest ally seems to be *P. dysorata*, M. & P., which it strongly resembles in its remarkably cylindrical form, but from which it may easily be distinguished by its greater length, comparative narrowness, rounder aperture, and much finer sculpture.

18. *Pupa sykesi*, M. & P.

Var. *inconspicua*, Burnup.

Although, while differentiating *inconspicua* from *sykesi*, M. & P., from the material then at my disposal, I considered it to be a distinct species, I can now only concur with Melv. & Pons. in treating them as one. In coming to this decision I am largely indebted to Dr. R. Sturany, who not only identified for me specimens from Dukuduku Forest, Zululand, as being *P. pentheri*, Stur., but also sent me co-types of his species collected by Dr. Penther at Umbilo Road, Durban. His specimens are somewhat intermediate between *sykesi*, M. & P., and *inconspicua*, Burnup, and leave no doubt as to all three forms belonging to one species. *P. pentheri* must therefore be placed in the synonymy of *sykesi*, and *inconspicua* may be retained as an elongate, narrow, fusiform variety of the same species.

In adopting my description of the var. *inconspicua* in its entirety to represent their species, Melvill and Ponsonby are led into certain errors, in that their type is more conic and less fusiform than the var., and has only about $6\frac{3}{4}$ whorls instead of $7\frac{1}{2}$, while the aperture is more than, instead of nearly, $\frac{1}{4}$ of the height of the shell; besides which the dimensions given do not refer to the type, which measures:—

Height 1·82, width 0·83.

It may be noted that while the height of *inconspicua* is greater than that of the type, the width is less. As this attenuate form has so far only been met with at Dargle, it may well be a local race.

19. *Pupa tabularis*, M. & P.

The dimensions of the figured specimen, which is in Mr. Ponsonby's collection, are not given in the Survey. They are as follows:—

Height 3·63, breadth 1·88 mm.

20. *Pupa tetrodus*, Bttg.

1870. *Pupa tetrodus*, Bttg. Ber. Offenbach. Ver. Naturk, xi. p. 46, pl. i. figs. 1 *a–c*.

1880. *Pupa* (*Vertigo*) *sinistrorsa*, Craven, Proc. Zool. Soc. p. 618, pl. lvii. fig. 8.
1891. *Vertigo thaumasta*, Melv. & Pons. Ann. & Mag. Nat. Hist. ser. 6, vol. viii. p. 239.
1892. *Vertigo thaumasta*, Melv. & Pons. ibid. vol. ix. p. 94, pl. vi. fig. 7.
1908. *Pupa* (*Vertigo*) *sinistrorsa*, Craven, Melv. & Pons. Ann. & Mag. Nat. Hist. ser. 8, vol. i. p. 83.
1910. *Pupilla* tetrodus* (Bttg.), Abhandl. d. Senckenb. naturf. Gesell. Bd. xxxii. p. 446.

21. *Pupa* (*Fauxulus*) *capensis* (Kurr).

Var. *kurri* (Krauss).

Var. *pottebergensis* (Krauss).

These varietal names seem scarcely worth perpetuating, as all intermediate forms, as well as other forms with attributes of equal varietal value, exist.

22. *Pupa* (*Fauxulus*) *fryana* (Bens.).

23. *Pupa* (*Fauxulus*) *glanvilleana* (Ancey).

As Mr. Ancey described this shell very carefully and with close attention to detail in order that it might be recognized from description alone without the help of a figure, it may be taken for granted that no important feature was omitted from his diagnosis. It therefore appears to me that Melvill and Ponsonby erred in choosing the figure of my shell, found at Dargle, Natal, to illustrate Ancey's species in their Survey, for that shell does not by any means closely agree with Ancey's description, being shorter and wider than the typical *glanvilleana*, and possessing two plaits on the base of the peristome not mentioned in Ancey's description, besides showing other discrepancies. I cannot but doubt if the two forms belong to one species, but in our present ignorance as to what Ancey's shell really is through no figure having been published with his description, and the type not being available for reference, it is impossible to estimate exactly the extent of the divergence, so I have deemed it best tentatively to treat the Dargle shell as a variety of *glanvilleana*, with which it seems to have much in common.

* If B. B. Woodward's arrangement be followed, *Pupilla* becomes the subgen. *Jaminia* (s. s.).

Var. *darglensis*, new var.

Melv. & Pons. Ann. & Mag. Nat. Hist. ser. 8, vol. i. (1908) pl. ii. fig. 23 [as *Pupa* (*Fauxulus*) *glanvilleana* (Anc.)].

Shell small, conic-oval, rimate and very narrowly perforate, thin, shining, greyish horn-coloured, translucent, sinistral. Spire ovately conic; apex obtuse and mammillated. Whorls 7½, slightly convex, gradually increasing, with suture distinct but not deep, obliquely sculptured with close, sharply-cut, arched oblique striæ, except the first 1½ which are smooth, the last more convex, rounded below, much constricted towards the peristome and impressed towards the rima and small perforation, the long inrunning peristomatal processes and spaces between being represented on the outside by alternate grooves and ridges. Aperture upright, irregularly ovate, nearly closed with the following inrunning white plaits:—parietal 2, the first arising as a narrow thread high on the body-whorl, becoming broader and contorted as it descends, always receding inwards, to below the centre of the aperture, whence it is bent sharply back, embracing the parietal wall, till it is lost sight of in the interior of the shell; the second, also arising high on the body-whorl, is expanded on the left till it meets the peristome, with which it combines till the lobe of the labrum is reached, whence it doubles back in two foliaceous folds and descends as a simple plait, receding inwards and following a line parallel with the first till it too is lost sight of in the interior of the shell; labral 3, of which the upper two are small, though deeply penetrating the aperture, and rather close together; the third, though equally narrow, is very long and sinuous and as, in its progress towards the interior, it embraces the expanded outer lip, it is lost to sight till the far end reappears in the gullet; columellar 3, of which the upper two arise, thread-like, on the edge of the labium, becoming stouter as they curve inwards, the upper one entering at the junction of the parietal wall with the columella, and the lower about the middle of the columella, after taking a wide sweep towards the centre of the aperture; the lowest columellar plait is smaller, but long and penetrating: lastly, there are two plaits on the base of the peristome similar to the lowest columellar plait. Peristome widely expanded, but little thickened except by the plaits which arise close to the margin, paler than the rest of the shell, becoming white at the edges, where its outline is slightly peaked at the sources of the plaits; the ends converge and are connected by a stout glossy callus reaching

high on the body-whorl. The labrum is strongly lobed above the middle and bayed immediately below; on the lower part of this lobe the peristome is slightly thickened, almost to the extent of forming an eleventh plait, between which and the foliated extension of the lower parietal plait is formed a partly covered channel to the interior.

Height 3·77, width 2·13 mm.

Hab. Dargle (*Burnup*), also Inhluzani Mountain, Karkloof, and Mid-Illovo, all in Natal.

The colour of the shell in life is often whitish grey.

As a contribution towards the elucidation of this intricate group, Mr. J. R. le B. Tomlin has kindly sent me a shell, received by him many years ago from either Mr. Ancey or Miss Glanville as representing Ancey's species. It is not likely to be a co-type, as Ancey only mentions the one locality, East London, and Mr. Tomlin's shell comes from Albany: moreover, it does not agree in detail with Ancey's description; I can therefore only consider it a second variety. I am indebted to Mr. W. L. Radford for a further example, agreeing in all essentials with Mr. Tomlin's shell, which he collected for me at East London. As, therefore, my only two specimens come from different localities, a geographical, varietal name seems inexpedient; I therefore propose to associate it with Mr. Tomlin's name :—

Var. *tomlini*, new var. (Pl. X. fig. 7.)

Shell like var. *darglensis*, but larger and more conical, with peristome less effusively expanded, callus not extending so high on the body-whorl, and aperture not so much closed by plaits. The lobe and sinus of the labrum are less developed and the thickening of the peristome on the lower part of the lobe "almost forming an eleventh plait" is entirely absent, its place being taken by the first labial plait. The lower parietal plait is shorter and its foliated extension to the peristome much less effuse, leaving the sutural canal more open. In place of the two inrunning plaits on the base of the peristome there is only one, about equidistant between the lowest labral and lowest columellar plait. The colour of the varietal type is almost white, that of the co-type pale brown.

Height (type of var.) 4·0, width 2·11 mm.

„ (Radford's specimen) 4·17, width 2·27.

Hab. Albany (*Tomlin*), East London (*Radford*), both in the Cape Province.

In comparing these varieties with Ancey's description it must be borne in mind that probably what that author treats

as the uppermost of four "palatal" processes is much in the same position as that which I consider a second, or lower, parietal plait. Although, since (in the varieties at any rate) the process in question arises on its one side high on the callus on the body-whorl, and on its other side on the lobe of the labrum, it is conceivable that one student might consider it a parietal, while another treated it as a labral plait; yet I think there can be no doubt that it is (in the varieties) at least the homologue of the second parietal plait to be found in all other members of Ancey's section *Anisoloma*.

The var. *tomlini*, then, should be easily distinguished from the type by this plait being less strongly developed, and by the presence of a narrow perforation and a basal plait, absent from the type.

24. *Pupa* (*Fauxulus*) *mcbeaniana* (M. & P.). (Pl. X. fig. 8.)

This striking shell, larger than the preceding species and its varieties, may be horn-coloured, greyish-brown, or milk-white. Normally this species has nine peristomatal processes, viz. two parietal, two columellar, one basal, and four labral, of which last named the lowest is large, the central small, and above this, in the sinus of the labrum, are two, very small and close together. In the type, which is not available to me for examination, these two small plaits may be merged into one broad plait, as in the case of a shell from Inhluzani Mountain, in my collection; for the authors do not refer to a pair, nor does the original figure show it. One shell in my collection, also from Inhluzani, bears an additional plait at the base of the columella; but as it is only one example in many, and is otherwise normal, it must only be looked upon as a sport.

As the original figure is very deficient in the detail of the peristomatal processes, a new figure, drawn from a shell in my collection, collected at Dargle, is published herewith.

The dimensions of the figured specimen are as follows:—
Height 4·5, width 2·58 mm.

25. *Pupa* (*Fauxulus*) *pamphorodon* (Benson).

This species seems very variable as to size, the type measuring 9 mm. high and 4 wide, while the only specimen that I have measured accurately is 7·5 mm. high and 3·75 wide.

26. *Pupa* (*Fauxulus*) *pereximia* (M. & P.).

27. *Pupa* (*Fauxulus*) *ponsonbyana* (Morelet).
(Pl. X. figs. 9–12.)

As Morelet's description and original figure* do not clearly define the positions, nor even the number, of the peristomatal processes with distinctness, and, moreover, his figure, if correctly drawn, depicts an imperfect shell with the edges of the peristome chipped off, a new series of figures is here offered, which it is hoped will define the species sufficiently clearly to obviate the necessity of revising the description. The figures are drawn from four shells from Grahamstown, kindly supplied to me by Messrs. Ponsonby and Farquhar, and show to some extent the variability in size and general form of this very interesting little species. The measurements of a few other shells are given, below the dimensions of the figured specimens, showing the extremes of such shells as I have examined.

Fig. 9. Height 3·43, width 1·71 mm.
„ 10. „ 3·05, „ 1·43 „
„ 11. „ 2·97, „ 1·55 „
„ 12. „ 2·81, „ 1·43 „

Dimensions of a few other specimens:—
Height 3·52, width 1·52 mm.
„ 3·59, „ 1·86 „
„ 3·33, „ 1·73 „
„ 2·84, „ 1·42 „
„ 2·74, „ 1·43 „

The crown of little hairs about the middle of the last whorl, referred to by Ancey [Journ. de Conch. vol. xlix. (1901) p. 141], arises in the peripheral sulcus and extends upwards in the suture, but the hairs are very easily rubbed off. They are not shown in the figures, because washing, so necessary to obtain a clear view of the peristomatal processes and a correct estimate of the depth of the sculpture and suture, has removed every vestige of the hairy coronet. I have examined many specimens and have found the number of peristomatal processes, in addition to the two parietals, to be invariably seven.

So far I have only collected two specimens in Natal (at

* Journ. de Conch. vol. xxxvii. (1889) pp. 9, 10, pl. i. fig. 5 [*Pupa* (*Faula*) *ponsonbyana*, Morelet].

Hilton Road and on Zwaartkop near Maritzburg), and they are remarkably high and narrow, the former measuring 3·53 mm. high and 1·62 mm. wide.

The dimensions referring to shells figured in the Survey and herein are taken in the same positions as the shells are shown in the figures; thus the measured width of any specimen may vary considerably according to whether it is drawn showing a front or a side view, especially if the labrum be much expanded.

The types of the new varieties described in this paper will be placed in the British Museum.

EXPLANATION OF PLATE X.

Figs. 1, 2. *Pupa crawfordiana* (M. & P.).
Figs. 3, 4. *Pupa layardi*, Bens.
Figs. 5, 6. *Pupa layardi*, var. *minor*, Bens. ?
Fig. 7. *Pupa* (*Fauxulus*) *glanvilleana* (Ancey), var. *tomlini*, new.
Fig. 8. *Pupa* (*Fauxulus*) *mcbeaniana* (M. & P.).
Figs. 9, 10, 11, 12. *Pupa* (*Fauxulus*) *ponsonbyana* (Morelet).

BIBLIOGRAPHICAL NOTICE.

The Amphipoda of Bermuda. By B. W. Kunkel. Trans. Connecticut Acad. Arts and Sciences, vol. xvi. pp. 1–116 (1910).

The tropical Amphipodous Crustacea are still so imperfectly known that this account of species collected in shallow water at the Bermuda Islands is very welcome. Forty-five species of Gammaridea and Caprellidea are described and figured in considerable detail, of which fifteen are regarded as new, and three new genera are established. No mention is made of the Hyperiidea, though it is hardly to be inferred that this extensive suborder is unrepresented in the Bermudan fauna. In some cases the identification of species described by previous authors is not placed beyond doubt. For example, the form referred on p. 10 to *Amphilochus brunneus*, Della Valle, differs from the original account of that species in several of the most important specific characters, but no explanation or discussion of the fact is given. The author's references to literature are scanty and not always correct. For the Caprellidæ he quotes Mayer's Monograph of 1882, but neither the important "Nachtrag" to that work published in 1890 nor the equally important "Siboga" Report of the same author (1903). Verrill's description of *Cyamus fusicularis* is reprinted, but no attempt is made to show why the species should be regarded as distinct from *Cyamus physeteris*, Pouchet. W. T. C.

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LII.—*On the Structure of* Magelona. By Prof. M'Intosh, F.R.S., Gatty Marine Laboratory, St. Andrews *.

In his observations on the Annelids from the Island of St. Catherine, off the coast of Brazil, Dr. Fritz Müller, in 1858, briefly mentions †, under the name of *Magelona papillicornis*, a remarkable form with a flattened snout, two long tentacles furnished with cylindrical papillæ, corpusculated blood, and other features which appear to agree in the closest manner with the British annelid which forms the subject of the following remarks. The type was next referred to by Dr. Edouard Claparède in his account ‡ of a larval form which he found at St. Vaast la Hougue, on the west coast of France. The same singular species, however, as that indicated by the first-mentioned author was probably originally discriminated by the late Dr. George Johnston, of Berwick §, but as his description was not published until 1865 ‖—long after his death—the name (*Mæa mirabilis*) he gave it lapses. In Britain it has occurred abundantly at St. Andrews, and also, as Dr. Carrington first showed ¶, at Southport; indeed,

* Translated from the Zeitsch. f. wiss. Zool. Bd. xxxi. p. 401 (1878).

† "Einiges über die Annelidenfauna der Insel Santa Catharina an der Brasilianischen Küste," von Dr. Fr. Müller. (Aus einer brieflichen Mittheilung an Prof. Grube.) Hierzu Taf. vi. & vii. Archiv für Naturges. 1858, p. 211.

‡ 'Beobachtungen über Anat. u. Entwicklungsgeschichte wirb. Thiere an der Küste von Normandie angestellt,' Leipzig, 1863.

§ From preparations forwarded by the distinguished botanist, Dr. Greville.

‖ 'British Museum Catalogue of Worms,' p. 278.

¶ Proceed. Lit. & Philos. Soc. Manchester, iv. 1865, p. 185.

it probably inhabits similar sandy flats at and beyond the margin of low water on many shores—in company with *Valencinia armandi*, *Glycera*, *Aricia*, *Spio*, *Lanice conchilega*, and the crustacean and molluscan fauna characteristic of such sites.

It is a slender annelid, 150 mm. to 200 mm. in length, pale pinkish anteriorly, dull greyish green (from the glands of the digestive chamber) posteriorly. The snout is cycless, remarkably flattened, translucent, and thinned at the edges, like a pointed spatula. Behind a constriction on each side of the head a long tentacle occurs, the anterior surface of which has rows of elongated papillæ of a somewhat cylindrical outline. The segments of the body are numerous, and they gradually diminish posteriorly and terminate in a broad papilla with a cirrus at each side, a little beyond the anus.

The body is divided into two well-marked regions, in the first of which (besides the head) are nine double pairs of bristles, and in this respect it approaches the *Heterospio longissima* of Prof. Ehlers*, which also has nine anterior segments. The inferior groups are simple, delicate, and tapering, and they have a larger free portion and a more pronounced terminal curve than the superior series. Both have lateral expansions or wings, which, however, are wider in the superior bristles and most pronounced posteriorly. The latter are also more numerous.

The ninth series of bristles has undergone special modification. Each of the four broad fan-shaped groups consists of slender translucent bristles with dilated tips and filiform processes. The enlargement at the tip seems to be formed by a modification of the wings, and various degrees of development can be traced in them: thus in one of those next the few simple bristles (with broad wings) which correspond with the anterior tufts, the dilatation at the tip being comparatively slight. Next the foregoing a larger tip is found, and then the well-marked series occurs, the axis or shaft tapering to a fine point near the tip, while the wings continue as broad margins, and coalesce into the translucent expansion with the filiform process. In the dorsal groups there is only a tendency to the formation of the simple bristles at each end of the row, the rest consisting of those with the enlarged translucent tips. The bristles of this segment would appear to be homologous with the special forms in the third segment in *Disoma*, the fourth in the Chætopteridæ, and the fifth in *Polydora*, and probably are of

* Zeitsch. f. w. Zool. Bd. xxv. p. 60.

service to the animal in protruding its anterior region from the sand into the surrounding water for aeration and food, as well as forming a special fulcrum during the movements of the snout and anterior region in boring.

Behind the preceding each segment is furnished with two rows of hooks on each side, all corresponding in structure, viz. winged hooks with bifid crowns, the most anterior having the larger wings. When the hooks are viewed in front the wings form a complete guard by uniting in a translucent arch superiorly.

In the posterior region of the body a tuft of simple curved bristles occurs as a kind of support to each pillar of the lateral lamellæ. Moreover, a very fine tuft of hair-like bristles, only observed on careful examination in the living animal, projects behind the pedicle of the lamella in the same region. It is difficult to believe that such are the tips of the former, yet no others can be seen in the mounted preparations. Such are probably homologous with the curious hidden spicular or asbestos-like bristles in *Polydora*.

In the first region of the body the bristles and processes are situated at the extreme front of each segment, near the segment-junction. The ninth series occupies a prominent ridge near the middle of their extremely short segment. In the posterior region the hooks are placed at first toward the anterior margin of the segment; they then gradually pass backward till they reach the posterior border of each segment laterally.

The anatomy of *Magelona* may, for convenience, be arranged under the following heads :—

I. The Cutaneous System, including: 1. The Cuticle, and 2. The Hypoderm.
II. The Muscular System.
III. The Digestive System, including the Proboscis.
* IV. The Circulatory System.
* V. The Perivisceral Fluid.
VI. The Nervous System.
VII. The Tentacles.
VIII. The Reproductive System.

* IV. and V. have already been translated in the Journ. Anat. & Physiol. vol. xiii. pp. 331–343 (1879). Further remarks may by-and-by be made, especially in connection with Prof. Benham's more recent researches.

I. The Cutaneous System.

1. *The Cuticle.*

In the snout the cuticle forms a dense translucent investment, thickest in the median line dorsally and diminishing toward each lateral margin. On the ventral surface the same arrangement occurs, but the coat is appreciably thinner. In front of the mouth the depth of the cuticle increases in the median ventral region, especially behind the separation of the central longitudinal muscles. It then diminishes in thickness and becomes continuous with the superficial layer of the oral region, and will be considered under that head. Toward the posterior end of the snout a considerable layer occurs on the body-wall below the decreasing lateral expansions, which likewise have a thicker covering than in front. In the anterior region of the body it forms a well-marked layer, though it is proportionally thinner than on the snout. On the whole, it is thinnest on the lateral regions and the lamellæ beyond the pedicles, while it attains its maximum on the ventral surface under the nerve-cords and toward the median line.

When the living animal is viewed from the ventral surface the small hypodermic pads existing on the fifth, sixth, seventh, and eighth segments, just in front of the transverse division of the feet, cause a distinct forward arch of the cuticle in the median line. The elevation on the fourth segment is indistinct and the eighth is less than the seventh. At the latter a pale belt is observed on each side, slanting backward to meet in the median line, and from the point of junction a single central band is continued posteriorly. Such probably indicates the union of the neural canals.

In the second or posterior region of the body the cuticle is thinner than in the first, the densest part being in the ventral median line, where the nerve-cords occur. It is very attenuate at the tip of the tail.

The cuticle (with the hypoderm) is thrown into very regular wrinkles in contraction. Pores are very difficult to see in this apparently structureless tunic, even in the most favourable regions, such as the cuticle covering the tips of the tentacles and the papillæ of the same organs; but very fine specks stud the cuticle of the anterior region of the body. In life the surface of the cuticle shows many fine palpocils.

It is this coat more than any other which gives firmness and elasticity to the annelidan surface and distinguishes it from the soft ciliated skin of the Nemerteans (toughness of

cuticle, as in this case, often coinciding with entire absence of cilia). Instead of that disintegration of surface which so readily takes place in the latter, it is often found that the tough hyaline cuticle holds together, as in a bag, the decaying and pulpy internal tissues. In this form the cuticle is characterized by its great strength on the head and anterior region of the body, so as to enable it to resist the friction inseparable from such active habits in the sand. M. Claparède observes that the sedentary annelids are characterized by the delicacy of this coat, a condition he attributes to the special protection afforded by their tubes; and the habits of *Magelona* would explain the structural differences in this respect between the anterior and posterior regions of the body.

The habits of *Magelona* seem to be too active for the attachment of external parasites (Infusoria &c.) which are common in *Nephthys* and other forms that burrow in the sand.

2. *The Hypoderm.*

The hypoderm forms a very large proportion of the tissues of the flattened snout *, the whole region outside the four muscular compartments being occupied by it; and when the snout attains full development the lateral hypodermic expansion almost equals in breadth the entire muscular region. The lateral expansion is often deeply frilled during life, and, moreover, presents certain secondary folds within the edge—features which would lead one to suppose that it contains no muscular fibres. In front of the dilatation at the origin of each tentacle a semilunar fold, with the concavity directed outward, occurs at the margin. The hypoderm also forms a wedge-shaped mass between the median muscular compartments anteriorly. After the muscular chambers are fully formed the snout may be divided into a median and two lateral regions, though, of course, the tissue is quite continuous. The dorsal hypoderm forms an almost uniform belt of cells and granules, which, in vertical transverse section, present numerous nearly vertical streaks. The breadth of the ventral hypoderm is greatest toward the median line, diminishes at each side to a mere streak under the external muscle, and again expands in the lateral region. The symmetrical streaks of the median part (which is more

* *Ranzania*, a form included under the Chætopteridæ by M. Claparède, has a large bilobed flattened snout (Supplément, 'Les Annél. Chétopodes du Golfe de Naples,' p. 126, pl. xi. fig. 1).

compact and granular than the rest) are directed from each side downward and inward, then outward toward the narrow part under the external muscle. The lateral division has the form of a lanceolate process on each side, the wide base abutting on the convex margin of the muscular compartment, from which a chitinous plate proceeds outward along the central line. The hypodermic tissue is lax at the basal or wide portion, and becomes more granular toward the free margin in the preparations. In transverse vertical section the soft connective-tissue fibres extend from the central chitinous plate upward and outward dorsally and downward and outward ventrally, the whole having the aspect of a leaf with its midrib and veins. At the external margin a fan-like arrangement of the fibres occurs. In vertical longitudinal sections a similar appearance is found, though in this case the leaf is almost linear. No trace of capillaries occurs in the lateral or other hypoderm of the snout.

Proceeding backward, the ventral hypodermic tissue increases in bulk, and its structure becomes more distinctly fibrous, and by-and-by it passes upward so as to separate the median muscular spaces, as in front. In the large area formed between the latter spaces the fibres of the hypoderm follow definite courses. Dorsally they sweep from the cuticular margin downward and outward to the inner muscular compartment, and a few of the inner fibres pass to the chamber for the blood-vessels beneath. Ventrally they are directed from the latter and the chitinous process externally, downward and inward to the cuticle. Such fibres would aid in retaining the muscular chambers in position during the varied movements of the snout and give firmness to the region. Still increasing in extent, the ventral hypoderm then presents a small oblong area above the cuticle, in the median line. This is the precursor of the great transverse space immediately behind. Above the latter space the hypoderm is vertically streaked by somewhat isolated bands of fibres, and numerous granular cells occur all over, especially in the more opaque central region superiorly. When the latter has reached its full development the large dorsal area with its dense covering of cuticle is divisible into two parts—an upper cellulo-granular and an inferior fibro-granular region—stretching from side to side between the remnants of the central longitudinal muscle. The fibres are chiefly transverse in direction, though some (apparently pertaining to the vertical series previously mentioned) pass at right angles to these from above downward to the roof of the space. The ventral hypoderm is now much more lax and

the cuticle thinner, and there are indications, *e. g.* the lateral frill, that the mouth is approaching. The lateral expansions of the snout (which resemble alæ in transverse section) also diminish considerably, their shape alters from the lanceolate to a more or less cylindrical condition, and then, by a basal constriction, they resume a clavate appearance. The cuticle on these expansions is much thicker dorsally than ventrally, and, while the chitinous raphe is placed in the lower third instead of the middle of the processes, the hypodermic fibres preserve the same arrangement in front. Immediately behind the transverse space alluded to above, and in a line with the commencement of the dorsal longitudinal muscles, the hypoderm somewhat increases in thickness toward the base of the expansion, slightly narrows at the dorsal arch, and again expands before the decided narrowing occurs over the dorsal longitudinal muscles. From the inferior border of the base of the lateral expansion a chitinous septum joins the raphe at a somewhat acute angle, and cuts off a narrow strip of hypoderm, to which and the great lobe, projecting beneath the expansion, it acts as a party-wall. The ventral hypoderm has now merged into the foliaceous surface of the oral region.

The lateral expansions of the snout then decrease (in transverse section) to simple processes in which the raphe is barely visible and then disappears. They spring from a thick mass of hypoderm marked by certain large areolæ, and which gradually diminishes dorsally until the middle line is reached. A slender neck of hypoderm proceeds downward along the now slightly projecting process beneath the expansion, and then enlarges to form a bulbous ventral mass, which contains the nerve-cord with its neural canal (situated externally). It then becomes continuous, by a narrow strip, with the buccal region. The expansion soon shrinks to a blunt process, and the hypodermic band between the dorsal and ventral regions elongates. The ventral hypoderm also increases and its cuticular investment is thicker. At the origin of the tentacles the hypoderm of the snout forms an arch over their base, the outer edge being thick, while the inner part of the arch is more translucent. In some views it simulates an aperture.

Behind the oral region the hypoderm still forms a complete ring. A narrow arch occurs over the dorsum, but it widens at each side and at intervals runs into the lateral lamellæ, which, with the exception of the delicate cuticular investment, are almost wholly formed of this tissue. A somewhat thick layer courses down the lateral region and

over the longitudinal ventral muscle—on the ventral surface of which it increases in depth,—to protect the nerve-trunk situated in the hollow next the oblique muscle. The layer then gradually diminishes toward the middle line, and, passing over, follows the same arrangement on the opposite side. The neural canal now lies on the ventral aspect of the nerve-trunk. The thick layer on the lateral dorsal regions has the hypodermic fibres directed upward and outward, while the fibres in the ventral masses at the nerve-trunks pass outward and downward. The hypodermic nerve-area soon becomes quite ventral in position, and the neural canal is inferior and internal to the nerve. The latter is further protected by a thicker layer of cuticle than that on the dorsum. Just below the inferior bristle-bundles (at the lower edge of the attachment of the oblique muscle) a rather constant fold of the hypoderm and cuticle occurs from the fourth to about the eighth segment, and in transverse sections a space (or canal) appears in the hypoderm. The granular matter next the basement-tissue is also increased at this point.

The chief change that ensues in the anterior region of the body is the gradual diminution of the hypodermic area between the nerve-cords. The neural canals, leaving the latter, glide inward to the middle line, first getting under the convex bellies of the transverse muscles and then uniting in the centre. The nerves still occupy a position on each side under the point of attachment of the vertical and oblique muscles. In regard to the disposition of the other parts of the hypoderm it may be mentioned that besides the increase at the nerve-cords, other thickenings occur at the opposite points of the dorsal region in the preparations (viz. at the dorsal end of the vertical muscular band). The shortening and diminution of the transverse ventral muscle toward the posterior end of the region permit the nerve-cords to approach each other; indeed, little hypoderm is left between them around the median (neural) canal. In the ninth segment the dorsal hypoderm is divided into a narrow layer over the muscles and the two great dorsal lamellæ. That on the lateral wall of the body has diminished in depth, but the ventral hypoderm is not much altered. Then the great infero-lateral lamellæ occupy the body-wall, and confine the ventral hypoderm to a narrower area. Finally, the dorsal layer diminishes in thickness and spreads outward, so as to inaugurate the condition of the posterior region, which consists of a very thin firm granular layer of hypoderm over the dorsal longitudinal muscles, with a deeper

wedge in the middle line, and a slightly broader region at the sides where it joins the lamellæ. The lateral wall has a better marked, and in the preparations a loosely cellular, belt (due to the escape of the bacillary corpuscles), while the ventral is denser and somewhat broader. The nerves have now come so close together that the neural canal is thrust beneath them. The fibres of the hypoderm slant downward and inward beneath the neural canal on each side in contraction. The cuticle is very thin over the lateral regions, somewhat thicker on the dorsal aspect, and comparatively dense over the nerve-area.

Toward the posterior end this coat forms a very thin layer over the dorsal and ventral longitudinal muscles, widening at the outer edge of each to join the thicker lateral hypoderm in which bacillary cells abound. On each side of the subneural canal there is an increase in breadth, but the median dorsal wedge is insignificant. Near the tip of the tail, again, the neural hypoderm is somewhat larger and passes further outward ; that on the lateral regions also stretches further upward and downward, and abounds in large bacillary cells. The neural canal disappears toward the tip of the tail.

The tapering tail ends in an intermediate rounded portion and two lateral cirri, as in certain other members of the Spionidæ. Each of the latter processes has a thin covering of cuticle, the rest being hypodermic tissue, the cells or glands being arranged in a somewhat regular manner, especially along the posterior border, where they pass from the cuticle downward and inward. The cells are flask-shaped or fusiform and contain granules and bacilli. The hypoderm of the cirri blends smoothly into the rounded intermediate portion.

The description of the lateral lamellæ (which are two on each side) falls under this head. Each of these (to take, for example, the fourth or fifth behind the ninth bristle-bundles) has a delicate cuticular investment, the interior being formed by hypodermic tissue. At the base of the lamella is a group of simple bristles (formerly mentioned) which apparently serves to strengthen the pedicle. In certain views a channel appears in the latter, but no fluid has been seen therein, neither is there a vascular coil in the process. During life considerable contractions occur on the concave side, where the striated muscular fibres lying within the curve of the bristles of the process pass from the inferior margin of the upper lamella to the body-wall, and then turn outward to the upper border of the inferior process.

In the anterior region the dorsal lamellæ, as usually seen from the dorsum, are larger than the inferior and somewhat more translucent. In front of the insertion of the bristles is a pad of cuticle and hypoderm. While the inferior lamella is smaller, its bristles are longer. The lamellæ of the ninth body-segment are very prominent, and between them and the pads in front the bristles project. In the posterior segments each forms a large fan-shaped process extending from the body-wall, and a pad at the base bears the hooks. In addition to the lamella there is a small conical hypodermic papilla (which, in the living animal, at first sight resembles the point of a spine) at the inner side of each row of hooks. Toward the tail they assume a filiform appearance, and in section their structure approaches that of the caudal cirri.

In minute structure the hypoderm very much resembles the cutis of the Nemerteans, presenting under pressure a series of flask-shaped cells or glands, from which the contents often escape in the form of clear and granular globules. Moreover, it contains a vast number of bacillary cells or glands, the structures being slightly acted on by water, which are found abundantly in the snout, cover for the most part the entire anterior region, and besides being continuous along the sides in the posterior region, form a band across the body behind each row of hooks. They are very conspicuous in the caudal region.

Most of the so-called granular glands or cells, indeed, seem to be bacillary cells. The appearance of the latter varies according to position, for when seen on end each appears to be granular, while a lateral view exhibits the rod-like bacillary bodies. These organs are soon destroyed by pressure and are not well seen in most spirit-preparations. They are best observed in living or fresh animals in sea-water, are common in the Spionidæ, and are termed by M. Claparède bacilliparous glands. When pressure is made on the posterior end of a fresh specimen the enormous numbers of these cells and bodies is remarkable, and the latter often form stellate groups on piercing the cuticle. Many of the cells contain pigment and others a large clear globule.

In the tentacles are a number of small but distinctly granular hypodermic cells, which form rows in the contracted state between the rugæ of the cuticle, at the base, below the papillose margin.

A hypodermic process (like a short conical tentacle)

projected from the edge of the snout in a specimen apparently undergoing repair after injury *.

II. The Muscular System.

Head.—The muscular system of the snout consists of a median and a lateral pair of longitudinal muscles.

The median form symmetrical muscles which stretch from the tip of the snout (in advance of the lateral) to the mouth. Viewed from above the fibres slant backward and inward toward the middle line throughout the greater part of the muscles; but after they separate posteriorly the direction of the fibres is more nearly transverse—slanting from above downward and inward at a wide angle and as a boldly marked series. If a transverse section be made at the very tip of the snout, the area is hypodermic and cuticular, with the exception of two small oval regions representing the attachments of these muscles, which are widely separated by a hypodermic wedge. The latter gradually diminishes, so that by-and-by the section of the central muscles has the aspect of a pair of spectacles, the muscles forming the eyes and the nasal bridge being represented by the chitinous connecting-bar, which is continuous with the investment of each muscle.

As the chitinous basement-tissue just mentioned is of considerable functional importance in the snout, it may be well to describe its arrangement before proceeding further with the muscles with which it is intimately associated. As indicated, the chitinous supports in this region of the snout form for each muscle a complete investment, which, moreover, is connected with its fellow by a median bar; while from the outer edge of the chitinous rim a thin lamella passes outward to the tip of the hypodermic expansion, and therefore represents the claspers or limbs of the spectacles (in transverse section). By-and-by (proceeding backward) a

* In these days of elaborate instrumental aids it is well to mention that, though the majority of such appliances were at command, nothing better has been found than the following simple method of examining the structure of such forms in the prepared state:—The specimens are placed in absolute alcohol, fitted to very fine corks, again immersed with the latter in alcohol, cut in the hand with a keen razor, and mounted in chloride of calcium. Dexterity will not, as a rule, enable the observer to make trustworthy researches on badly prepared examples of the Annelida. If the tissues are so soft that the pressure of the thin glass cover injures them, it is sometimes convenient to mount them with a very fine section of the cork in a suitable position.

second chamber is formed by a loop which adjoins the lateral and inferior part of the former and surrounds the tip of the blood-vessels, as well as inferiorly the origin of the lateral muscles. It is from this anterior loop that the chitinous lamella of the lateral expansion originates. By the gradual coalescence of the inner margins of the chitinous rings of the median muscles their outline in transverse section resembles a figure of eight; and the lateral loop forms quite as large a chamber appended to each side. Coalescence of the chitinous basement-tissue goes on rapidly, so that a figure resembling a crown is next formed by the investment of the central muscles. Dorsally is a gently convex arch, which dips downward at the median line to join the strong vertical partition, and curves downward externally at the point of junction with the outer wall of the external chamber and the intermediate septum. The latter passes downward and inward to meet the short ventral (chitinous) floor, which in the preparations is slightly drawn upward, where it unites with the vertical septum. The external loop is large and rounded, but is thinner than the investment of the central muscle. It joins the transverse floor at the junction of the external septum, and on each side encloses the external muscle and the special space for the blood-vessels, which lie on the septum between it and the inner chamber. The crown-like arrangement of the chitinous basement-tissue is retained throughout the greater part of the snout, though, by the increase of the lateral chamber and the change in position of the vascular area, the appearances around it are somewhat altered. The median and the lateral septa and the transverse ventral plate are the strongest portions of the chitinous apparatus. The investment of the outer compartment and the loop enclosing the vascular area are thin.

When the ventral hypodermic tissue in front of the mouth attains considerable depth, the median sulcus of the chitinous crown superiorly is much increased by the shortening of the septum; and by-and-by the figure-of-eight shape is again assumed, the lateral septum being almost horizontal throughout the middle third, over the vascular area, which now projects inferiorly in its special chitinous investment. Both chambers are sensibly diminished, and finally the median separate to form with the lateral a figure of eight in transverse section on each side of the central hypoderm. The chitinous ring for the central muscle is irregularly round and has a firm loop for the vessels attached inferiorly, while the outer still gives off the lateral lamella. Then the chitinous investment of the vessels moves to the inner and

inferior margin of the central muscular area, and sends a bar to meet its fellow of the opposite side. The chitinous supports of the vascular area and the septa between the muscular spaces are strong. Lastly, the median muscular investment disappears, leaving, about the origin of the tentacles, only the external chamber, which sends a process outward to the base of the tentacle, and another from the same point to join the ventral cuticle; while between these lie the hypodermic nerve-area and the neural canal (superiorly and externally). The chitinous investment does not closely surround the external muscle, but, sending its lower bar upward and inward, a considerable space is by-and-by formed. Thereafter the chitinous layer is continued backward as the external support of the muscle, and may for the present be left.

The chitinous basement-system thus constitutes a kind of endo-skeleton for the entire snout, giving, with the cuticle, firmness to the organ in its ceaseless thrusts into the sand, supporting its muscles, and confining their action (in lieu of a circular coat) to the most favourable lines, and with its flexible plates—even more than the beams of a ship—lending the necessary power of resistance to the yielding tissues of the snout and protecting the blood-vessels. Moreover, the continuity between the base of the tentacles and the chitinous support of the ventral longitudinal muscles gives a completeness to the system which most admirably adapts the whole anterior region for its special functions.

It is found—to continue the account of the median longitudinal muscles—that they are not simple bands, but, as might be inferred from their chitinous investment and the arrangement of the fibres, they act to a certain extent obliquely as well as longitudinally. Before the appearance of the lateral muscles at the tip of the snout, and when the spectacle-like arrangement of the pair exists in transverse section, each consists of a thick dorsal arch of fibres, which proceeds a short distance downward at each end, while the ventral part of the chamber is occupied by granular tissue. The muscular fasciculi are nearly linear and slant from above downward, with varying degrees of obliquity according to the condition of the preparation. When the spaces assume the form of a crown, fasciculi pass from the arch nearly at right angles; others extend from the upper part of the median septum downward and inward. Moreover, the outer fasciculi from the external septum join the larger which pass to the bottom, then curve inward along the ventral chitinous floor, and meet the descending fasciculi at

the median septum. The histological characters of the lower half just described differ from the superior, in so far as the whole section is more granular and the striæ less distinct; indeed, in most views it presents a glandular appearance with numerous concentrically arranged striæ. Soft cellular substance generally fills up the space in the centre. When the crown-like appearance in section has attained full development, the muscle in each central space is most bulky internally, and the fasciculi from the median septum extend further downward, the arrangement having a somewhat pennate appearance. Before the separation of these chambers occurs (*i. e.* when they have assumed the form of a figure of eight) the muscle occupies about three fourths of the diminished area, passing from the upper half of the short median septum, and extending past the junction of the external chamber superiorly. The direction of the muscular fasciculi is also more horizontal—except at the outer or superior border,—and the cellular or glandular tissue is much less. The latter becomes still more diminished, and the fasciculi in the nearly circular area are directed downward and inward, the most conspicuous occupying the middle. Finally the muscle ceases in ordinary sections in a line with the tentacles. The median muscles are thus confined entirely to the snout, and, from their relations with the chitinous environment, act in various ways on the flattened organ. The presence of the cellular or glandular tissue within the same sheath and its changes in those bearing the lateral organs are also noteworthy. The whole tissues of the snout, indeed, sympathize with such changes, for the muscles become less firm and more granular, the chitinous supports less distinct, and the blood-vessels, as will be seen afterwards, shrink to short trunks about a third their ordinary length.

The lateral muscles of the snout take origin anteriorly a little behind the former, gradually widen into broad ribbon-shaped bands, then become narrower toward the mouth, and are continued backward as the ventral longitudinal muscles of the body-wall. Their fibres are chiefly longitudinal in direction, and in partial contraction the muscles in the snout assume a barred appearance at the outer margins—the bars or ridges slanting from without inward and slightly backward. Careful examination in the fresh specimen also reveals a series of very fine transverse fibres, which, from the triangular region in front of the mouth to the anterior third, slant forward and outward. In general arrangement these muscles present in the snout certain well-marked differences from their subsequent structure. In front each

at first appears in transverse section as a small band, lying chiefly below the median muscle, and having the vascular area superiorly and externally. When the crown-shaped arrangement of the central muscles occurs, the external (or lateral) have attained a somewhat larger size, and their fine parallel fasciculi in section are placed in a concentric manner round the chitinous loop. Each muscle therefore forms a hollow process in the snout, and in the fresh specimen, under compression, granules and cells rush to and fro in the median space. The latter, in the preparations, holds lax cellulo-granular tissue—also somewhat concentrically arranged. The septum between it and the median muscle is, for the most part, occupied by the vascular area and presents no fasciculi, so that the muscle thus has the form of the letter U, the thickest mass occurring superiorly, and the thinnest at the curve of the U externally. At the tip of the U superiorly the fasciculi are directed downward and outward, and inferiorly upward and more obliquely outward. Proceeding backward the area of the muscle largely increases, chiefly toward the ventral surface, but the general direction of its fasciculi is the same. Before the separation of the muscles in front of the mouth the area, again, considerably diminishes, especially in regard to the lax central tissue. Immediately after the separation, the gap caused by the passage of the vessels under the central area is filled by the latter tissue, and the limbs of the U approach each other more closely at the tip, but they do not unite. In a line with the base of the tentacles the small rounded area of each lateral muscle in section is almost entirely occupied by the fasciculi, which are nearly horizontal in direction, the upper, however, inclining downward and the inferior upward. There is now a tendency toward a ventral position, the superior curve of the muscle disappearing and the inner ventral region increasing in size. Behind the tentacles it is almost vertical, with the fasciculi for the most part directed transversely, the convex chitinous support being external—its superior edge running into the basement-tissue under the dorsal hypoderm; while the inferior border terminates at the insertion of the oblique muscle (in this region vertical) which forms its inner border and shuts it in a special compartment. In the concavity of the muscle is still found a little of the lax cellulo-granular tissue. The muscle gradually enlarges and moves downward so as to get beneath the bristles and toward the infero-lateral region. About the ninth body-segment it becomes chiefly ventral in position, then rapidly diminishes in size at this segment,

and is wholly ventral, though with the same immediate relations, viz., the external (now ventral) chitinous layer, and internally the fibres of the oblique muscle. In the fresh specimen the rapid diminution and increase of each muscle and the perfect continuity of the fibres are well shown. Thereafter it rapidly enlarges and approaches the middle line, assuming an ovoid form in transverse section—the deepest fasciculi being in the middle. On attaining full development in the posterior region, the size exceeds that of the dorsal, the fasciculi slanting from the summit of the nerve near the median line outward to the attachment of the external vertical muscle. The outline in the preparations (transverse sections) is convex inferiorly—an approach to the condition observed at the commencement of the anterior region of the body. It still has a very thin chitinous investment externally, and the oblique muscle bounds it internally, except the ova distend the body-wall and separate them. Toward the tip of the tail a considerable diminution takes place before its termination.

In the ordinary condition of the snout, as well as during the development of the peculiar organs on the sides of the body, a granular fluid is observed oscillating (under compression) in the interior of both cephalic muscles (median and lateral). The detached globules (which roll about) seem to be associated especially with the changes and altered nutrition of the reproductive period, and occur throughout the whole extent of the muscular cavity.

After the separation of the central muscles of the snout the conspicuous hypodermic fibres already described occur in both dorsal and ventral regions. Such are probably elastic, and are connected functionally with the great central vascular region. They form a somewhat radiate arrangement around the ventral space inferiorly. Posterior to the fibres just mentioned are a series of muscular fibres, which subdivide the great vascular area—wide in the middle and narrow at the ends in transverse section. They form a powerful transverse muscle connecting the inferior ends of the external chitinous septa (between the central and external muscles) and the inferior borders of the former area. The space is further divided by a series of strong fibres which pass from the centre and sides of the roof downward to the ventral chamber, where they spread out, forming intersecting bands. As the central muscle of the snout rapidly disappears in this region, the transverse muscular plate is attached at each side to the somewhat angular inner border of the chitinous investment of the

lateral (external) muscle; and it is clear that this powerful band is the chief agent in narrowing the snout from side to side. Proceeding backward it is found to increase in strength, while the vertical fibres in the inferior space diminish (a few occurring laterally). Then a stronger vertical series, springing from the middle of the chitinous arch superiorly—between two lateral channels—and spreading out in a fan-like manner through the powerful transverse plate above mentioned, reaches the ventral hypoderm with its base and obliterates the inferior space. The two muscles are evidently antagonistic in action, and their important functions in connection with the vascular system may be further exemplified by contrasting specimens in which the region is contracted with those in which it is largely dilated. The inner wall of the chamber being composed of elastic chitinous tissue, very great expansion is permitted. In longitudinal sections the transverse muscle is well seen in its space just in front of the mouth, with the vessels at its upper border. The space or cavity is comparatively short (antero-posteriorly); indeed, it is confined to the pre-oral region. Further, the vertical fibres from the chitinous superior arch seem to meet over the transverse muscle and send bundles in front of and behind it—the latter being the stronger. The fibres of the vertical muscle are attached to a chitinous plate, which springs from the anterior border of the superior transverse muscle, beneath which the dorsal blood-vessels pass. The latter muscle in some preparations is narrow and deep in the middle, and spreads out at each side.

The next muscles that come under notice are the longitudinal dorsal, which, when viewed from above, take origin between the forks of the chitinous process over the mouth as narrow ribbons, widen till about the sixth set of bristles, then diminish to the ninth, and again spread out thereafter. In section they are found to commence in front of the vascular space as two small slips surrounded by the usual chitinous basement-tissue situated over the transverse muscle. They then pass below the latter, increase in size, and form the superior arch of the chamber for the dorsal blood-vessel. Proceeding backward they gradually extend outward and enlarge—the deepest part of each being toward the middle of the muscle, and the thinnest near the mesial line, where a raphe occurs. Externally is the hypodermic basement-tissue, internally (in the median line) the dorsal blood-vessel and the œsophagus at the sides; laterally each abuts on the origin of the external lateral muscle. Toward

the ninth body-segment each muscle diminishes to an irregularly rounded area situated over the dorsal blood-vessel, the two muscles in the preparations being about as broad as the constricted intestinal canal of the region. Then a strong series of oblique fibres appears beneath, and, indeed, they are circumscribed by muscles all round. This narrow part merges into the greatly increased dorsal longitudinal muscles of the next segment. Thereafter the two large muscles are at first separated by an intermediate hypodermic process, which passes downward to the apex of the oblique muscle and the alimentary and vascular systems beneath; then a simple sulcus is left, from which the fasciculi in transverse section pass off in a pennate manner. The latter arrangement forms a projecting portion which impinges on the septum between the dorsal blood-vessels. The fasciculi of the other parts of each muscle resemble those of the ventral. By-and-by the median pennate region becomes very distinct and regular, though less separated from the general body of the muscle. In the centre is the chitinous septum, which is attached to the plate between the dorsal blood-vessels; while from each side of the former the fasciculi proceed in a nearly horizontal manner, except at the lower fourth, where they incline downward like a brush, and their fibres become more evidently striated. The pennate arrangement continues toward the posterior end, near which the fasciculi are deepest next the middle line of the dorsum; but it disappears before the termination of the muscle, a section near the top of the tail presenting a simple ovoid appearance.

The advent of the mouth ushers in considerable changes, which may be taken in series according to their position in the body-wall from before backward—in transverse section. In the dorsal hypoderm the section of the small longitudinal muscle appears on each side of the middle line, resting on a narrow transverse muscle which spreads out at each end over the vascular trunks to the tentacle. It has in the middle line inferiorly a central projection to which the vertical fibres of the space formerly alluded to are attached. On each side of the median line, beneath the transverse muscle, is a continuation of the nerve-centre. The muscle is intimately associated with the functions of the oral and post-oral regions, attaining great development for a considerable distance, and then, as the longitudinal dorsal increase in magnitude, disappearing from the central region. Just over the origin of the nerve-trunks from the cephalic mass, the muscle forms a continuous transverse band,

stretching from a chitinous origin at the inner surface of the hypoderm, at a point over the longitudinal ventral muscles, to a similar attachment on the opposite side. In contraction it usually presents a double fusiform appearance—pointed externally, and narrowed at the middle line under the longitudinal muscles. The tentacular blood-vessels seem to pass between it and the longitudinal ventral in this region. While the external terminations of the muscle immediately become simplified by attachment to the upper end of the chitinous support (which becomes continuous with the dorsal hypodermic basement-tissue) of the longitudinal ventral (at this point lateral) muscle, the central region is rendered complex by the gradual increase of the dorsal longitudinal muscle, which causes the fibres to bend downwards *. Thus a narrow band of the vertical muscle passes over the outer edge of the median longitudinal, and a strong belt of the dorsal transverse separates them from the blood-vessel beneath. A vertical slip of fibrous tissue passes from the hypoderm to the roof of the chamber for the dorsal vessels, between the longitudinal muscles. Thereafter the latter descend entirely beneath the transverse muscle, and a chitinous band separates the fibres in the middle line. The course of the muscle under the hypodermic basement-tissue and its insertion are similar, and it is pierced by the fibres of the oblique. Further backward the distance between the dorsal origins of the muscle greatly increases, until on each side its divisions are thrust into a dorso-lateral and then a lateral position, while the fibres are correspondingly shortened. Toward the ninth body-segment, while the longitudinal dorsal and ventral muscles decrease in bulk, that just mentioned is much enlarged, stretching on each side as a broad and powerful mass over the whole dorso-lateral and lateral regions. At the ninth body-segment it is still large, and its outer border seems to impinge on the great bristle-wings. The increase in the size of the longitudinal dorsal and ventral muscles in the posterior region of the body, and their positions, render this muscle nearly vertical and of considerable length on each side. It extends from the hypodermic basement-tissue at the external border of the dorsal muscle downward to the outer border of the ventral and during the reproductive season is often greatly stretched by the vast increase of the ova.

In the living animal the median fibres of the transverse

* Longitudinal sections show the fibres of this muscle passing over the longitudinal dorsal very clearly, just before its separation by the median chitinous raphe.

dorsal muscle are seen from the anterior border of the mouth to a little behind the tentacular bases. Moreover, a thin but distinct layer of circular fibres envelops the body-wall—after its complete formation—beneath the hypodermic basement-tissue. It is continuous to the posterior end of the worm.

In the space occurring on each side of the mouth, and which is in connection with the great vascular chamber, are a series of vertical muscular fibres, proceeding from the dorsum and attached in the first instance to the upper border of the buccal mucous tissue. They occupy the region between the longitudinal ventral muscle and the latter, and probably act as retractors of the tissue. The fibres soon increase in strength, and occupy the whole of the somewhat triangular area between the longitudinal muscle laterally and a line drawn from its inferior curve to the dorsal median line. The fan-shaped mass of fibres converges to pass the longitudinal muscle, but being connected with the proboscis their insertion is not observed so readily; though in extrusion of the latter organ they are seen to bend over into it and become attached, chiefly at the external aspect. In the latter condition of the proboscis the fibres anteriorly assume, for the most part, a vertical direction, and, as it were, bound laterally the great mass of longitudinal muscular fibres which are placed next the inner border in the extruded organ. Then (proceeding backward) it is noticed that some of the outer vertical fibres, which pass down from the dorsum close by the ventral longitudinal muscle, become attached to the chitinous continuation of its inferior boundary, and thus cease to extend into the extruded proboscis. Further, the fan-shaped mass of fibres is split into two by the intervention of the blood-channel. Many of the fibres still pass into the proboscis, but they soon cease to do so, and are fixed to the chitinous plate above mentioned, in company with the great transverse ventral muscle. The latter is attached to the ventral aspect of the chitinous basement-tissue, and therefore probably acts in opposition to the fan-shaped vertical series. From the extensive connection of the latter with the dorsal region, and the strength of the transverse ventral muscle, almost the whole body-cavity will be firmly compressed during their contraction and the proboscis expelled.

The interposition of the blood-channel in the great fan-shaped anterior muscle—already noticed—separates it into a vertical and an oblique division. The vertical fibres spring from the common origin at the outer border of the

longitudinal dorsal and the region external to it, and pass obliquely downward to be inserted at the inner border of the ventral. The oblique arise from the wide region between the upper (external) border of the longitudinal ventral upward to the superior lateral region, and the fibres extend downward to the outer part of the common insertion—close to the inner border of the longitudinal muscle. Shortly after their attachment, as described, to the basement-tissue, the arrangement of both is somewhat interfered with by the very large fasciculi which pass transversely outward from the sides of the alimentary canal to the body-wall (in the extruded state of the proboscis). The fibres of the oblique, again, at this part seem to run superiorly into the largely increased lateral vertical. Immediately behind, the vertical appears as a nearly cylindrical muscle (in transverse vertical section), and the vascular channel lies between it and the oblique. Masses of the great fasciculi (from the alimentary canal) still occur at the superior and inferior attachments of the vertical muscles, and probably represent the retractor muscles of that part of the pharyngeal region which is thrust into the proboscis. By the gradual passage of the longitudinal ventral muscle downward, the inferior fibres of the oblique become more horizontal, and both vertical and oblique muscles attain great development throughout the entire anterior region of the body, so as to act as powerful compressors, while their elongation and contraction directly affect the blood-channels between them. On approaching the ninth body-segment the lower fibres of the oblique are nearly horizontal, and both this muscle and the vertical are large; indeed, as the dorsal and ventral longitudinal muscles diminish in bulk, the former increase. Immediately in front of the last-mentioned segment the relations of the muscles are unchanged. It is then noticed that a series of muscular fibres arise from the superior insertion of the vertical, outward along the whole upper arch of the body, and, indeed, to a point considerably below the upper fibres of the oblique. These by-and-by form a powerful fan-shaped mass sweeping continuously from the raphe at the dorsal longitudinal muscle, and at first even extending over the latter, to the edge of the longitudinal ventral inferiorly, and converging to the raphe at its inner border. In some preparations fibres are observed to pass into the transverse ventral muscle so as to form a continuous band. The direction of the fibres of this great muscular expansion is not straight or vertical, but they curve from before backward, as well as from above down-

ward and inward. The foregoing arrangement thus holds the whole body-cavity in control, and, like the complex muscles of the vertebrate heart, must materially aid the blood-vessels in propelling the blood forward into the anterior region and in keeping it there—during the contraction of the other muscles of the part—by firm closure of the channel of communication. Its importance, therefore, in regard to the functions of the proboscis is apparent.

With the diminution and atrophy of the transverse ventral muscles over the nerve-cords in the posterior region, the vertical and oblique also coincide, so that by-and-by only a few slender fasciculi of each remain—stretched from the dorsal raphe in the case of the vertical and the lateral wall in the oblique, to the atrophied transverse on each side of the ventral blood-vessel. Toward the extremity, again, both become well developed, the oblique spreading from the outer part of the arch over the nerve-cord upward and outward in a fan-like manner to the body-wall; while the vertical extend from the median part of the arch outward and then upward to the exterior of the dorsal longitudinal muscles.

As soon as the under lip of the animal becomes continuous beneath the extruded proboscis, a series of transverse fibres pass—from the raphe at the inner side of each longitudinal ventral muscle—quite across the body, and thus form a very efficient expulsive system, as well as a barrier to return after extrusion. It is probably this muscle which is observed in the living animal, after expulsion of the proboscis, stretched as a very strong transverse band or arch between the bases of the tentacles, apparently blocking (with the pre-oral, transverse and vertical) the passage of blood forward into the cephalic contractile space, and forming an abutment against the posterior part of the vascular sinus behind the triangular region. When the animal is viewed from the ventral surface (the proboscis being withdrawn) the fibres pass right across the body-wall in front of the first bristle-bundles. Behind the latter they become somewhat indistinct, but at the third pair they are very evident—extending inward and slightly backward to the central raphe. They are broad in front and gradually diminish toward the posterior end of the region. This ventral transverse muscle continues for some distance backward as a powerful layer, and then presents a chitinous raphe in the median line, so as to form two muscles. Throughout the anterior region the latter stretch from the common raphe externally to the ventral median line, under the hypoderm, and they are sometimes

shortly fusiform or almost baccate in contraction, especially toward the termination of the region, the median ventral sulcus being very deep. At the ninth body-segment many of the fibres, as formerly noticed in connection with the great fan-shaped muscle of the part, seem to pass right across the median septum, from one muscle to the other. They diminish much immediately thereafter, so that at the commencement of the greenish intestine in the next segment only their form is indicated by two small swellings on the band between the longitudinal ventral muscles. Finally, the chitinous band into which they degenerate separates the ventral blood-vessel from the nerve-cords, and externally gives attachment to the vertical and oblique muscles. This double-bellied condition of the atrophied remnant of the transverse muscle is continued to the posterior end of the worm—little more than the chitinous tissue (which in front supported the muscle) being left.

The muscular arrangements of the anterior region of the body render the presence of dissepiments unnecessary, so that the first occurs at the commencement of the posterior division, and they are continued in each segment to the tail. Each forms a muscular screen situated a short distance behind the lamellæ and hooks, and, while permitting the passage of the perivisceral fluid, serves to support the intestine and the blood-vessels.

The bristle-muscles are on the whole feebly developed and somewhat indistinct, but they seem to agree with those in allied forms. The roots of the superior bristles of the anterior region pass obliquely inward to the upper part of the vascular space between the vertical and oblique muscles, and the special slips radiate outward to the hypoderm. The roots of the inferior, again, abut on the upper part of the hollow of the ventral longitudinal muscle. Their special slips follow a similar arrangement. Those of the ninth body-segment have homologous relations with surrounding parts, but they form a much larger fan-shaped transverse series, the diminution of the dorsal and ventral longitudinal muscles affording ample space for their expansion. In the posterior region of the body the great increase of the longitudinal muscles just mentioned causes the hooks to assume a more or less vertical position. Their muscles are similar to those moving the anterior bristles ; and as they are on elevated hypodermic processes continuous with the lamellæ, both are probably acted on thereby.

The foregoing muscular system enables the animal to perforate the moist sand with great rapidity, as well as to

swim freely in the water in a wriggling manner; indeed, when fresh, its vivacity is remarkable.

III. The Digestive System.

The mouth opens at the base of the flattened snout as a somewhat triangular or T-shaped slit surrounded by lips of mucous membrane, and situated between or very slightly in front of the bases of the tentacles. The anterior lip is sinuous but complete, while inferiorly is a wide fissure (bounded laterally by prominent margins) which runs a considerable distance backward. The lips are very mobile, and in life frequently expand to gulp water, a feature common in the Spionidæ, but of importance, in relation to the blood-channels in the neighbourhood, in this form.

The alimentary region behind the mouth is somewhat complex, and may be divided into pharynx, proboscis, œsophagus, and intestine. In using these terms, however, no special weight is placed on them, though it is probable that the barred region of the pharynx is homologous with the proventriculus of the Syllidæ and others; while the œsophageal division may consist of gullet and ventricule combined. In the retracted condition of the proboscis the general arrangement is as follows:—The buccal leads into a pharyngeal division, which is thrown into numerous prominent rugæ, especially posteriorly, and it is further characterized by the muscularity of its walls. To this region is appended the protrusible proboscis in a manner afterwards to be explained. Behind the pharyngeal is the œsophageal division, which continues to the ninth body-segment and terminates in the intestinal region proper.

It has already been noticed that the hypodermic tissue of the ventral surface of the snout becomes greatly hypertrophied in the median region throughout a considerable area in front of the mouth. It is especially deep anterior to the space for the transverse muscle, and at the space may fairly be said to assume the lax translucent character distinctive of the alimentary modification. In longitudinal sections the point of separation is recognized by the thinness of the cuticle. Externally is a distinct layer of transparent chitinous tissue continuous with, though much thinner than, the cuticle, then a series of granular and rather translucent gland-cells between the former and the basement-tissue. The buccal folds occupy a large area in protrusion of the proboscis at the point of separation of the dorsal transverse muscle, and they are somewhat symmetrically arranged.

The centre superiorly and the sides near the ventral surface inferiorly are marked with brownish pigment. This buccal region, indeed, may be defined as that lying between the oral aperture in front and the great vertical muscle posteriorly, the latter, moreover, corresponding to the anterior attachment of the dorsal wall of the proboscis. It has its ventral margin for the most part open and only completed in the living animal by the approximation of the included proboscis, or the closure of its own walls. The buccal mucous tissue is not extruded to any extent; that behind is. To the sides of the buccal region are attached various muscular bands, which probably retract the buccal flaps or lips during the extrusion of the proboscis. The anterior buccal tissue, further, is pulled upon by a series of horizontal fibres which come from the anterior part of the roof of the pre-oral chamber in front. At the termination of this region is superiorly a narrow arch of the buccal wall, upon which the dorsal blood-vessel lies, and laterally two wide folds which diminish at their outer and inferior angle, where they are joined by the proboscidian wall.

The next or pharyngeal region begins at the junction of the proboscidian wall above mentioned, and is further characterized by the presence of a series of longitudinal muscular fibres, which appear outside the basement-tissue of the lateral regions. The outer margin of the glandular layer has laterally a considerable breadth of finely granular tissue, then the chitinous basement-substance, and externally the layer of longitudinal fibres, which are entirely lateral in position, *i. e.* extending from the dorsal to the ventral curve on each side. The canal at this point is much enlarged, while inferiorly the broad glandular lining becomes thinner, and merges into the chitinous coat of the proboscis, which, near the junction, shows an incipient glandular layer internally. Further backward bands of strong oblique fibres are attached to the inferior and outer region of the canal—now completed. These muscular bands are evidently the retractors of the organ. Superiorly a narrow retractor is inserted into the wall of the canal at the bend, a larger pair occur laterally, and a similar pair at the ventral border (the specimen had ejected its proboscis but not its pharynx). The latter muscles pass transversely outward to be attached to the great mass at the raphe above the longitudinal ventral muscles. The dorsal region of the chamber still has a thin arch of mucous tissue, while it is massive at the sides and ventral region. A slender muscular band from the dorsal raphe (at the side of the dorsal longitudinal) passes inward

to the arch of the canal. It is now noticed that the wall of the pharynx is greatly thickened by muscular layers, which—with the massive retractors—fill up a large part of the body-cavity superiorly. The insertions of the great retractors in the lateral regions are crossed by the circular fibres, which extend from the superior fold (beneath the arch) of one side to that of the opposite, thus forming a strong constricting layer, very well marked inferiorly. External to the latter at the ventral surface is a complex layer consisting of longitudinal fibres mixed with a radiating series which pass from the inner margin through the circular coat. Behind the foregoing the attachment of the retractors to the superior raphe is evident, the breadth of the circular layer is increased, especially inferiorly, and the vertical series, which radiate downward through the latter, form a prominent mass—striated with cross-fibres—inferiorly. The ventral region or floor of the pharynx has again opened out into a less compact and apparently a chitinous tissue. The structure remains similar in the next section superiorly, but inferiorly the mobile glandular region of the pharynx appears in the middle of the great muscular mass, the sides and ventral region being formed by a complex meshwork of muscular fibres—longitudinal, oblique, and radiating—which connect the inferior to the superior mass. In full development this system shows a great central region of folded glandular tissue, surrounded superiorly by the circular fibres and the retractors, laterally and inferiorly by the densely interlaced muscular fibres, those next the canal, however, being chiefly circular in direction. The muscular envelope next diminishes in thickness, and is confined for the most part to the lower half of the canal. Within is the circular coat, which proceeds almost to the superior arch (in transverse section); then inferiorly is a considerable belt of longitudinal fibres with interfascicular substance. This coating descends lower until it forms—for the somewhat specialized ventral floor of the region—an inner strong circular band, and a radiated mass (with longitudinal fibres) nearly as broad beneath, the fibres passing vertically through the former to the glandular border. This complex arrangement—diminishing to a mere speck—finally disappears, and leaves the chamber surrounded only by its proper walls, which at the termination of the pharyngeal portion are a thick basement-tissue and an outer layer of longitudinal and circular fibres.

The pharyngeal region is interesting as containing that portion of the canal which, to a greater or less extent, is thrust into the proboscis in extreme extrusion, and the

special muscular arrangements well adapt it for such a function. The exsertile portion, forming a distinct fold, occupies the dorsal region, and is characterized, in addition to its muscular development, by having the inner surface of its floor thrown into very prominent transverse rugæ, which in the uninjured animal appear externally as well-marked bars. In extrusion a great curve takes place behind the buccal region, downward and forward into the base of the exserted proboscis: yet, though the folds are boldly defined, it is difficult to follow their windings, or to estimate their exact relations with the parts in the retracted condition. Further, it occasionally happens that the great muscular plexus of the protrusible part is inverted, *i. e.*, is situated dorsally instead of ventrally. The region supplied with the well-marked muscular coat is much dilated in the interior of the proboscis, and this special disposition will materially aid in the withdrawal of the organ to its position in the body. In longitudinal section the circular muscles of the pharyngeal coat are observed to be clasped between the radiating series in linear spaces, while the diverging form a very regularly looped system of crossed fibres, which probably have a somewhat spiral arrangement (and the indistinctness of the longitudinal fibres in transverse section would thus be accounted for). The chief muscular retractor, attached posteriorly to the superior raphe on each side, is well shown, as is also a band of fibres from the latter raphe, which passes backward for insertion at the anterior part of the extruded organ, and which would pull it inward and forward in retraction. Anteriorly, again, fibres proceed from the anterior fold of the organ (ventrally) forward to the fold of the buccal glandular tunic, where it joins the proboscis; and in the extrusion of that tissue the anterior region of the pharynx would be pulled on, thus explaining, in all probability, the inversion of the latter, which sometimes, as above mentioned, shows its muscular coat superior in the extruded region.

The expulsion of the proboscis is doubtless the primary agent in the movement of this pharyngeal region, then follow the dragging on the anterior part by the ventral fibres and the action of the body-walls of the animal. In withdrawal, again, its great retractors, and the contraction of the expanded special coat, with its longitudinal, looped, and other fibres, would suffice to bring it into position.

The Proboscis.

This organ in life is thrust out at somewhat regular

intervals, during the boring operations of the animal, as a pinkish distensible sac, which, especially in partial extrusion, often presents a most regularly rugose appearance. In complete expulsion the general form is that of a reddish apple marked with flattened ribs, which run from the deep dimple at the apex to the base. At the upper part of the protruded organ is a somewhat elongated conical smooth portion, marked only by the fine longitudinal lines of the retractor muscle and not by ribs. The blood chiefly occupies the upper and middle regions, but this is due to position, since there is no reason why it should not enter any hollow portion of the extruded organ. Within the body of the animal it forms a longitudinally folded sac continuous anteriorly with the great transverse inferior lip, and placed along the ventral region of the body-cavity, below the digestive system. Posteriorly it ends in a *cul de sac*, to the sides and termination of which the great muscular retractor is attached. The upper and anterior fold, again, is continuous with the buccal mucous surface, so that in extrusion an uninterrupted rim is found at the sides, while the centre of the alimentary canal is blocked by the outward folds of the pharynx, the protrusion of the proboscis being thus inimical to swallowing; indeed the functions of the organ are not digestive.

In partial protrusion the proboscis under pressure presents a series of somewhat radiated lines—due to the prominent chitinous folds of its lining membrane, in which no pores have been made out. The fibres of the short and long retractors spread out in the central region, and the organ is crossed by the fibres of the circular coat. The fibres of the short retractors, which pass from the dorsal raphe on each side of the body-wall, expand in a fan-like manner, chiefly at the basal part of the extruded organ, and therefore in the retracted condition are connected with its anterior region; while the fibres of the long retractor spread over a wider area, for the most part toward the outer part of the organ in protrusion, and thus in retraction are attached to the posterior region. In extreme protrusion it forms a large flattened bag, which does not quite reach the tip of the snout. Externally, and especially at the tip in extrusion, is the dense chitinous coat, continuous with that of the mouth superiorly, and with the cuticle at the transverse fold or lower lip inferiorly: beneath is a streaked granular layer homologous with the hypoderm of the body-wall; indeed, continuous with it. In partial protrusion this coat follows the previous in forming numerous elevated ridges and folds—

sometimes of a symmetrical appearance, especially if one fold of the proboscis is included within another. A basement layer succeeds the foregoing, and then a coat of circular fibres, which attains its greatest development at the superior or inner side (*i. e.*, next the snout in extrusion) and especially near the base. There does not appear to be any special longitudinal coat, other than the expansion of the long retractor muscle on the walls near the extremity of the extruded organ. At the latter region the thinner parts have crossed fibres internally, an appearance probably due to the commingling of the circular coat and the expanded fibres of the long retractor. The latter forms a great muscular mass which occupies the dorsal region of the organ in extrusion, and therefore lies under the digestive canal on approaching the body-cavity. It then is included between the anterior fan-shaped retractors, which occupy the lateral region, and thereafter proceeds along the ventral region of the body-cavity to the termination of the anterior region. In transverse section the muscle is divided into many large masses, which are for the most part grouped in two divisions superiorly, and a flattened band applied to the upper surface of the transverse ventral muscle. The latter division—at the point of differentiation of the transverse ventral into two muscles—has become the most important, forming a compact layer of elongated fasciculi (in section); while the other divisions occupy the lateral regions in irregular masses and in diminished bulk. Finally, behind the pharyngeal region the lateral divisions disappear in the transverse sections—probably by being attached to the superior raphe at each side,—and only the ventral portion of the retractors remains as a firm double muscle with symmetrically arranged fasciculi, situated in the central line over the transverse ventral. As the muscle diminishes in bulk and approaches the central line on each side, a firm granular mass is formed, first beneath it, then at each side from the vertical muscle inward, and lastly above it—just before the fibres cease at the ninth body-segment, and in front of the commencement of the ventral blood-vessel. The importance of this muscle is shown by its extensive connections, all of which could not be readily destroyed at once, so as to interfere with the boring.

The foregoing structure enables the functions of the organ in the economy of the animal to be understood. By its agency the annelid can bore almost continuously forward in the sand and fashion a tunnel in which the more delicate posterior part reposes in safety. The contraction of the

muscular anterior region of the body, and the relaxation of its retractor muscles, cause the proboscis to yield readily to the powerful stream of blood that is sent against it from behind, and it smoothly unrolls outward from the transverse margin of the lower lip like a very supple membrane, the pinkish colour of the blood shining through the translucent tissue. The extrusion goes on until the brownish mass of the pharyngeal region of the digestive canal approaches the front of the first body-segment, and sends the muscular coil into the base of the proboscis, and partly under the long retractor on its way to the tip—like a plug,—assisting to retain the blood therein and giving solidity to the whole organ. Thus, in its progress forward, the flattened snout is thrust amongst the sand with an undulating and insinuating motion till it has advanced about its own length; then the proboscis is ejected to its full extent, like an indiarubber dilator, so as to make a suitable channel for the occupation of the body while again pressing onward the exploratory snout. Then all the retractile arrangements are brought into play—the fan-shaped vertical fibres pull in the basal (anterior) region, the short and long retractors act on the entire organ, and the withdrawal of the pharyngeal protrusion makes an open channel for the backward stream of blood, which rushes into the vessels of the anterior region out of the returning organ, further constricted by its own circular muscular coat. These alternate protrusions and retractions are repeated at somewhat regular intervals, and continued for a long time. Moreover, an explanation is perhaps afforded of the fact that the animal is partial to fine sand, seeing that the larger sharp fragments of coarse gravel and sand might injure either snout or proboscis, though the latter is specially protected by its chitinous investment.

Puncture of the anterior region of the body, so as to give exit to the blood, interferes with the extrusion of the proboscis; indeed, it is not generally thrust out after such an injury.

The exsertile pharyngeal region is followed by a mobile part of the alimentary canal that undergoes considerable elongation when the former is thrust forward, but which is variously coiled in retraction. In transverse section it is firm, often somewhat quadrangular, and consists, from within outward, of the chitinous-like inner tunic, the glandular layer (of less depth than in front), the basement-tissue, and, lastly, of an external coat of circular muscular fibres. After a short course backward the calibre of the canal diminishes, and a distinct sheath from the vascular system envelops it

externally; while certain longitudinal fibres which appear in the latter become by-and-by incorporated with its wall, which externally shows traces of longitudinal fibres, outside the circular, though they are difficult to discern. The relations of the organ with the vascular system at this part are, indeed, complex. The form of the alimentary canal in section near the ninth body-segment is now rounded or oval, with a smooth outline, and instead of the few bold folds of glandular tissue covered by the chitinous layer internally, the glandular substance is granular and projects in conical elevations or papillæ having a dendritic or radiated appearance. As the canal diminishes the latter become more pointed and translucent, the basement-tissue more prominent, and within the circular coat are distinct traces of a layer of longitudinal muscular fibres. At the ninth body-segment the circular coat is much thickened, the basement-tissue increased, and the glandular layer more consistent, so that it projects inward very distinctly. The canal reaches its minimum diameter about the termination of the transverse ventral muscles, near the commencement of the ventral blood-vessel. Just at the point where the dorsal longitudinal muscles begin to expand, the tube is surrounded by a powerful ring of muscular fibres, which in the mid-ventral line join a transverse chitinous raphe, from the under surface of which spring the strong muscular walls of the ventral vessel of the region. The canal has now increased a little in size, but is often squeezed (in the preparations) by the pressure of the superincumbent blood-vessels, so that it forms a transverse slit. It then passes the boundary-line into the succeeding region, and will fall under notice shortly.

The anterior region of the alimentary canal is distinguished as a whole by its greater muscularity and firmness, by the massive nature and chitinous covering of its glandular coat, and by the absence of evident capillaries from its walls. It presents a close homology with the Nemertean œsophageal region, especially in its relation to the circulatory fluid, for in the latter a *rete mirabile* likewise occurs. The minute structure of the wall is similar, but, as on the skin, the chitinous tunic internally in *Magelona* takes the place of the cilia in the Nemertean. Further, like the Nemertean organ, it retains irritability long after the death of the animal, and in dissection is often torn from the more fragile tissues of the anterior region as a tough thread. The functions of the parts, in regard to digestion, in the respective groups are probably similar, and may represent all the complex divisions

in front of the intestine. In *Magelona* the buccal and pharyngeal regions receive the food, the great development of the muscular and glandular tunics in the latter specially pointing it out as an important part of the canal. The smoother portion behind probably acts both as an œsophageal and a ventricular chamber, and thus the food would be partly digested before passing the barrier at the ninth body-segment.

Intestinal Region Proper.

The anterior border of the tenth body-segment shows in transverse section the whole tube greatly enlarged, while its glandular lining is in a transition-stage dorsally and ventrally. In the latter regions the tissue is composed of closely arranged—almost linear—granular glands. Then the entire canal assumes the soft greenish glandular condition characteristic of the posterior division, its superior arch being surmounted by and incorporated with the investment of the two great dorsal blood-vessels. Viewed from the dorsum in the living animal at the anterior third of the region, the centre is occupied by the dorsal vessels and the compressed glands, each with its central oil-globules; and occasionally a peculiar ramose or radiated appearance is assumed by the contents spreading from the latter as a centre. At the sides are large masses of bright orange oil-globules enclosed in a limiting membrane, and the presence of these usually gives the canal a deep brownish-orange colour by transmitted light. Moreover, if the specimen is in good condition the blood-vessels of the alimentary wall are seen as little beads as they bend over the margin, under pressure. In a lateral view the prominent condition of the masses containing the oil-globules is still more apparent. When the gland-cells are extruded into sea-water they appear as circular bodies filled with minute granules, and generally presenting a pale greenish hue. As a rule the glandular mucous tissue forms a thinner layer of lobate masses (in section) along the dorsal arch, and a thicker and more lax coating of large glands laterally; but, of course, much depends on the degree of contraction and the quantity of alimentary matter. In longitudinal sections of the canal the soft glandular lining is thrown at somewhat regular intervals into very symmetrical dendritic masses. Circular fibres occur all the way backward, though they are so thin as hardly to merit the name of a special tunic, and their feebleness is shown by the marked constrictions at the dissepiments, which cause the canal to assume a moniliform appearance—well seen in

longitudinal sections, but a special longitudinal coat has not been made out, either in transverse or longitudinal sections. The longitudinal muscular coat of the dorsal blood-vessels, and perhaps the ventral also, may, with the nature of the wall itself, aid in this respect. The internal surface from the tenth segment backward is probably covered with cilia (though they could not be made out in front), and they are well seen (though not so boldly marked as in *Nerine* and *Spio*) near the tail. The canal, retaining the same structure, though the circular coat becomes more distinct, diminishes toward the tip of the tail, and terminates in an anus on the dorsal surface a little within the margin. The latter part of the tract shows very active contractions, and the cilia at the anus are largely developed.

The food consists of sand containing various minute nutritious particles, translucent chitinous fragments of crustaceans, foraminifera, and other débris. Sand is very necessary for the existence of this form, for though the animals survive a considerable period in captivity in vessels filled with pure sea-water, they thrive much longer amongst fine sand, with a few inches of water over it. No parasites, other than an unknown ovum, have been seen in the alimentary canal—a very different condition from that of its congener *Polydora ciliata*, which has many Gregarinæ in the same organ.

VI. The Nervous System.

The central mass of the nervous system lies above the pre-oral chamber—and rather in front of the muscular blood-vessels of the part—in the form of two superior ganglia, and they are by no means easily made out in the living animal. Each consists of a mass of nerve-cells—some of considerable size, with a commissure of fibres—best marked posteriorly. In the hypodermic region below and in front of the chamber, another (smaller) nervous mass is seen in longitudinal section, but the actual connection between the superior and inferior divisions has not yet been made out. From the oblique appearance of the nerve-cords in section, they certainly pass very rapidly down to the sides of the body from the central mass, and in the living animal their course outward is similarly abrupt. There is no trace of eye-specks, but the animals are sensitive to light, and touch is highly developed.

When the nerve-cord reaches the lateral region it is found under the channel leading to the tentacle, and somewhat

inferior and external to the ventral longitudinal muscle. The area of the nerve in transverse section is crossed by strong vertical fibres (probably of connective tissue), and the neural canal is external, its compartment being separated by a distinct series of vertical fibres passing from the chitinous support of the ventral longitudinal muscle to the cuticle. Then the canal becomes more closely related to the nerve, while the latter moves under the ventral longitudinal muscle. As soon as the walls of the body are more completely rounded (in section) the neural canal occurs at the outer and inferior border of the nerve-area, which now lies under the raphe to which the vertical and oblique muscles are attached. Thereafter the neural canal glides on each side to the inner and inferior border of the nerve and its calibre is considerably increased. Each then gets wholly below the nerve, the most conspicuous vertical fibrous band being external. Within is a fine chitinous-like membrane, which does not form a very contractile lining, though the action of the fibres around it may assist in this respect. The canal shows no current of fluid in the living form, and all that can be said of it in the preparations is that it sometimes contains a translucent gelatinous substance. The nerves and neural canals preserve the foregoing relations till they reach the region in front of the seventh pair of bristle-bundles, where the canals leave the nerve-trunks, pass inward under the short transverse muscle, and unite in the middle line to form a single large canal, which thus lies between the nerves and separated from them by a considerable hypodermic interval. The extreme shortening of the transverse ventral muscles at the posterior part of the ninth segment permits the approximation of the nerve-cords, so that at the commencement of the median ventral blood-vessel they are situated at each side of the large neural canal, and soon (in the same segment) insinuate themselves above it. This arrangement continues to the posterior part of the body, but toward the tip of the tail the nerves form a single (united) cord; while the neural canal (which in the ordinary sections forms a large transversely flattened channel, like that of a non-contractile vessel) diminishes and disappears.

A series of fine nerve-branches, forming a plexus, is sometimes observed passing out to the lateral organs. The twigs run in a parallel manner at first, then diverge, their fine branches anastomosing in various directions.

VII. The Tentacles.

When the annelid is at rest amongst the sand it projects its extremely elongated tentacles through the aperture of its tube into the surrounding water, in which they are jerked to and fro, stand stiffly out, or are gracefully curved and moved in a serpentine manner here and there over the sand—indeed, when many are confined in a vessel the organs resemble independent worms. In large examples they measure, when gently curved from the aperture in the sand, about an inch and a half or two inches, and are capable of much greater elongation. In the extended condition of the organs the papillæ are very prominent at the tip, projecting like a series of pinnæ along the inner or anterior border, and susceptible of decided and independent movements. When the animal lies in a free condition on the surface of the sand the tentacles again are often beautifully coiled in a spiral manner or perform various independent vermiform movements. During the process of boring the tentacles are trailed behind and flatly applied to the body, their most delicate region being in the completed channel, while the stronger smooth part only meets the slight pressure of the sand against which the organs are thrust by the advancing snout. When reposing within its tunnel the organs are stretched in a parallel condition in front of it, ready to be protruded on the return of the tide.

Each tentacle forms a hollow contractile process, furnished with a series of papillæ along the anterior border. Externally it is invested by the chitinous cuticle, which is densest at the basal region on the smooth part of the organ. On reaching the bases of the papillæ this coat spreads over them likewise, but is extremely attenuated toward the tip. The subjacent hypodermic layer is largely developed, forming at the base of the tentacle a considerable investment throughout three-fourths of the circumference, while the remaining anterior region is greatly thickened, thus foreshadowing the special arrangement further outward. It is more finely granular than the hypoderm of the body, shows the usual fibrous or connective-tissue streaks, and likewise contains the pigment. Proceeding outward, the thick anterior hypodermic area by-and-by shows numerous low pale warts, which soon attain a considerable size. In the living specimen each papilla, in the somewhat contracted condition caused by slight pressure, has a rather narrowed base, and is composed of a continuation of the hypoderm and cuticle, as formerly noticed. The central region is occupied by a series of

muscular fibres, which diverge superiorly and inferiorly; the circumferential region is cellulo-granular, and the tip is granular, with a few palpocils. A cup-shaped form is often assumed by the blunt tip, as the central fibres are eminently contractile, and thus give a sucker action to the extremity. In some views the muscular fibres acting on the sucker-tip seem to be separated from the hypoderm of the process. Moreover, in the living animal the very fine palpocils cover the tip like a series of motionless microscopic cilia. Further, the walls of the papillæ have a few constricting fibres, which are the chief agents in elongating them. After pressure has continued for a short time various cells, mucous globules, and granules begin to appear at the sides and palpocils on the summit. Strings of mucus also shoot out, enclosing small bacillary cells. Within the hypoderm of the tentacle is a well-marked circular muscular coat, surrounding a thick longitudinal layer, which is arranged in regular fasciculi, and possessing a raphe at the attachment of the fibres of the vessels at each pole, that for the artery opposite the papillæ being most distinct.

In the central chamber of the tentacle are two vessels, an afferent and efferent. The afferent blood-vessel is the smaller and lies a little on one side of the pole opposite the papillose margin. Its wall on section presents the peculiar striated appearance seen in the anterior dorsal vessel of the body, and such is probably due to the same longitudinal fibres. Both during life and in the preparations it is firm and elastic, and in contrast with the widely dilated efferent vessel. The latter is not easily made out unless in good preparations, a suspensory band from the centre (or raphe) of the papillose region being attached to it, and then proceeding, like a membranous septum, to the opposite pole. A series of very distinct transverse mesenteries or dissepiments, again, exist in the tentacle, at regular intervals and almost to the tip of the organ.

The tentacles are reproduced with considerable rapidity. About the third day after removal the new organs appeared on each side as short blunt processes into which the blood entered. In other specimens they were about twice the breadth of the head, but had not yet begun to develop papillæ. A distinct artery and vein are apparent in those about as long as the head, but even though they are three or four times as long no capillary branches are apparent, the blood rushing in by the artery to return by the vein. When only one tentacle is being reproduced the activity in the circulation of the entire (*i. e.* the old) organ is very great,

and it is waved about in a vermiform manner in all directions. The facility with which the blood-vessels form, and the accuracy with which the various currents keep the required direction in the developing tentacles and other parts, is interesting. The developing papillæ in the growing organ first appear as short pale elevations of the hypoderm, and at a later stage are more acutely pointed than in the complete structures. At first they are also few in number, but gradually increase with the growth of the tentacle.

While the hypodermic and cuticular tissues of the tentacle are continuous with those enveloping the body generally, the chitinous basement-tissue and the muscles of these organs have a special arrangement. Where the tentacle joins the body-wall the basement-tissue bounding the ventral longitudinal muscle is specially thickened, and to this is attached the basal chitinous layer of the tentacle, by a short anterior and a long posterior curve (as seen from above). The special muscles of the tentacle take origin from this point. Moreover, at the termination of the median cephalic muscle, certain fibres of the transverse muscle, boldly marked at first (and in keeping with those of the central muscle), pass outward and backward to the base of each tentacle, where they are lost. Such are probably attached to the chitinous basement-tissue, and, as formerly noticed, aid in the movements of the region.

In a large male loaded with spermatozoa the tentacles were comparatively short and inert, and from the appearance of other specimens it is possible that at the reproductive season degeneration of the organs may occur in some instances, or the animals themselves may perish. Degeneration of the tips of the tentacles is common in confinement.

On the whole the tentacles show a further differentiation of the ciliated hypodermic groove observed in *Polydora ciliata* and other Spionidæ, in *Phyllochætopterus* and *Spiochætopterus*. The entire absence of cilia, however, demonstrates that these organs are not always distinctive of a respiratory function, as M. Claparède seems to think. The structure of the papillæ, again, would indicate that particles may be passed from the one to the other, and they often jerk independently. Further, in regard to the circulation of the organs, the great contractility of the muscular afferent vessel has an important physiological bearing, since it not only sends a swift current to the tip, but through the numerous capillaries which join it to the efferent. The latter also possesses a rapid current, but dilates very readily, especially when an obstruction occurs, as in the movements of

the proboscis. By rigid contraction, as formerly mentioned, the blood can be almost entirely driven from the tentacles. The organs thus capture prey and aid in aerating the blood.

VIII. The Reproductive System.

The sexual elements are developed in great profusion from the epithelium of the body-wall of the posterior region. In males the whole space between the dorsal and ventral longitudinal muscles is occupied by a mass of sperm-cells and spermatozoa, especially in summer—the animals, indeed, assuming an opaque greyish hue from this cause. The head of the spermatozoon is shaped like a conical bullet with a pointed tip, and two rounded bodies at the base, from the centre of which the elongated tail projects. The movements of the sperms are most active. Many circular cells are also observed amongst them.

The ova are similarly developed in the females, in the posterior region, within a very fine limiting membrane or ovary, and quite fill up the perivisceral chamber with the exception of the alimentary canal and the region for the dorsal and ventral blood-vessels. They abounded in examples at the end of June and had attained considerable size.

In both males and females with developed sexual products peculiar structures occur on each side of the body (invariably on the segment immediately behind the mouth—and in this it first attains perfection), as well as on many of the posterior segments, even in those of reproduced tails. In transverse section at the tenth segment the central structure is observed to lie within special projections of the body-wall outside the vertical muscle, which is coated by a granular layer. It resembles a folded mass, the folds at first sight simulating a convoluted duct. In the living animal the organ is first noticed in the middle of each segment as a somewhat ovoid projection of the lateral wall, and invested by cuticle, hypoderm, and basement-tissue. It gradually increases in size, and, when fully developed, presents from the ventral surface the form of a semicircular pad on each side. Closer inspection, however, shows that the latter is a tongue-shaped lamella, which curves upward to cover the folded membrane, while superiorly there is a slipper-shaped fold of similar structure which arches over the upper part of the membrane, its edge being incurved laterally and inferiorly. Such hypodermic folds seem to be formed by an outgrowth and splitting of the body-wall. The peculiar membranous structure is thus to some extent exposed to the

action of the water laterally, and presents in the fresh animal the aspect of a granular area crossed by numerous convolutions or folds, which often change their appearance under examination, like those formed in a translucent and very fine chitinous membrane. The whole, indeed, simulates a convoluted duct most closely, since the folds retain a uniform size throughout, though they are finer at one end of the mass. The latter can with care be enucleated from its covering, but in those examined no clear evidence of well-formed ducts (*e. g.* indication of a central cavity or an entirely free coil, on tearing) could be observed. It is possible that the ambiguous structure was only partially developed and that the folds may afterwards attain further differentiation. The exact function of this structure is unknown, and its presence in both sexes would show that it is not indispensably related to the ova. It appears to be homologous with the external ovaries or egg-racemes described by Prof. Möbius in *Leipoceras uviferum*, a form which closely resembles *Polydora**. It is still more nearly related to the egg-sacs (resembling a swallow's nest) mentioned by the same author as present along the sides of *Scolecolepis cirrata*, Sars†. It may be that the folded structure in *Magelona* acts the part of the network in *Scolecolepis*, by which the eggs are held in the pouches, but no proof of this has yet been observed. The whole arrangement, however, seems to be much more largely developed in *Magelona*. The analogy of this structure with a segmental organ can only be conjectural, though it is suggestive that M. Claparède describes a similar but more highly differentiated organ within the posterior region of the body in *Chætopterus*. Finally, so little is known of the life-history of *Magelona*, that nothing can be said of its connection with sexual or other variations.

No opportunity, unfortunately, was available for investigating the development of the species at St. Andrews. Though mature animals were abundant in summer, the extreme heat prevented success in this respect in the confined vessels, especially after the long journey from the sea-coast, while those with the reproductive elements developed late in autumn failed to afford a single embryo ‡. As previously indicated, M. Claparède found a developing form which he

* Ann. & Mag. Nat. Hist. 4th ser. vol. xiii. p. 201.

† *Op. cit.* p. 260.

‡ The surface of the sea was examined by the towing-net from the margin of full tide outward for several miles in September, but no larval type connected with this form was obtained. In subsequent years, however, all stages have been procured at St. Andrews.

considered to belong to the genus *Magelona*, Fritz Müller, at St. Vaast la Hougue. In its youngest condition it presents a somewhat club-shaped appearance—broad in front and rather narrowed posteriorly. The anterior end has an open ciliated funnel, then follows about twenty segments, each with a ciliated ring, while posteriorly the abruptly truncated tail has a ring of long cilia round the anus. In addition to the cilia on the funnel the anterior end bears a tuft at each side (doubtless homologous with the lateral cephalic pencil in the Nemerteans), besides a papilla armed with a tuft of bristles nearly as long as the body, after the manner of the young *Polydora*. The alimentary canal proceeds straight from mouth to anus. The next stage shows a heart-shaped snout with four eyes, and at the base between it and the body-collar a pair of short tentacles with brown bars (which differ quite from the dark pigment-bars of the tentacles in *Magelona*) on the anterior border near the tip, and a series of palpocils; while internally is a cavity containing a cæcal blood-vessel (according to the type M. Claparède states he usually found in the Spionidæ), with corpusculated blood. The first body-segment still bears at each side the tuft of long larval bristles, and is succeeded by eight distinct bristle-bundles. The ninth segment carries a row of hooks on each side. A simple pyriform anal papilla terminates the body. The alimentary canal is differentiated anteriorly into a muscular œsophagus, and the mouth closely approaches that of *Magelona*. Behind the œsophagus the canal exhibits two short glandular diverticula and then proceeds in the usual moniliform manner to the anus. The body is tinted with various brownish transverse bands. In this condition the flattened spatulate snout has a considerable resemblance to that in *Magelona*, but the subsequent stage shows less affinity, for the long tentacles have slender palpocils, which differ in character and arrangement from those in the British form. Moreover, the cephalic region has greatly diminished, its shape being that of a short truncated cone, with four eyes arranged in a transverse manner at the base. The first segment of the body retains the long larval bristles, but the succeeding segments to the eighth have lost their shorter temporary bristles. From the ninth segment backward, however, four or five pairs of longer and stronger bristles occur, in association with the rows of hooks (which conform in structure to the *Spio* type). The blood is bluish. The posterior end has the form of a peculiar hoof-shaped process furnished with small papillæ.

The fragmentary state, therefore, in which our knowledge

of the development of the genus is prevents identification of the foregoing with the British form unless a very decided metamorphosis occurs.

The systematic position of *Magelona*, with its peculiar external form and internal structure, was a source of uncertainty to Dr. George Johnston, the only author who attempted its consideration in this respect. So puzzled was he that he placed it (his *Mæa mirabilis*) at the end of his Catalogue for the British Museum under a family specially constituted for itself (viz. Mæadæ). In the Catalogue of the Fauna of St. Andrews it was located between the Chætopteridæ and the Spionidæ; but the results of further investigation clearly relegate it to the latter group *. It leans, indeed, wholly to the Spionidæ in minute structure, and especially to such forms as *Prionospio* and *Heterospio*, though it is true that in the marked regional distinctions and the great length of the posterior division of the body it approaches *Spiochætopterus*. While it conforms to the Spionidæ in the structure of its body-wall and bristles, it differs in regard to the absence of the dorsal branchiæ. In the mechanism of its proboscis and in the structure of its snout and circulatory organs, again, it presents features *sui generis*.

LIII.—*On Mammals collected by the Rev. G. T. Fox in Northern Nigeria.* By Oldfield Thomas.

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The British Museum owes to the kindness of the Rev. G. T. Fox, of the Cambridge University Mission in Northern Nigeria, a collection of small mammals from that country, and these prove to be so interesting as to deserve the publication of a list.

The specimens were mostly obtained at Panyam, on the plateau of that name, in Bauchi Province, about 9° 30′ E. and 10° N. The plateau is about 4000′ in altitude, and the climate is therefore comparatively cool. A few skins were collected at Kabir, on the slope of the plateau, at about 2700′.

The proportion of novelties in the collection is unusually

* Proc. R. S. E. 1875-6, vol. ix. no. 94, p. 123.

large, and shows how little this part of Africa has been worked. No less than six species and subspecies have proved to need description out of the small total of fourteen represented.

The most interesting form is the new mole-rat, *Georychus foxi*, as the only species of the genus previously known in West Africa is the widely different *G. zechi* of Togoland.

The collection is therefore a very valuable accession to the National Museum, and one most encouraging for the prospects of further work in the Colony.

1. *Eidolon helvum*, Kerr.

♀. 9. Panyam.
♂. 107; ♀. 106. Kabir.

2. *Rhinolophus* sp.

♀. 10. Panyam, 4000′.
Near *R. alcyone*, Temm.

3. *Petalia hispida*, Schr.

♂. 4. Panyam, 4000′.

4. *Pipistrellus culex*, sp. n.

♀. 100. Kabir. 2700′. B.M. no. 11. 3. 24. 4. Collected 15th May, 1910. *Type*.

A very small pale species. Inner upper incisors practically unicuspidate.

Size rather greater than in *P. stampflii* and *minusculus*. Fur about 4·5 mm. in length on the back. General colour above near "wood-brown," below rather paler, the hairs both above and below blackish slaty basally. Ears with a well-marked squarish lobe at the base of their outer margin; tragus without basal lobule, broadest opposite the middle of its straight inner margin. Wings from the base of the outer toe. Calcar with a narrow calcareal lobule.

Skull very delicate, low and narrow; the brain-case narrower than in *P. stampflii*.

Upper incisors slender, unicuspid, the outer nearly as long as the inner. (If a secondary cusp has been present on the inner tooth it must have been very small and close to the tip of the tooth.) Small premolar half internal, visible from without. Lower incisors tricuspid, not overlapping.

Dimensions of the type (the starred measurements taken in the flesh) :—

Forearm 28·5 mm.

Head and body *39 ; tail *27 ; ear *9 ; tragus on inner edge 2·6 ; third finger, metacarpus 27, first phalanx 9 ; lower leg and hind foot (c. u.) 14·5.

Skull : greatest length 11·1 ; basi-sinual length 8·6 ; interorbital breadth 3·3 ; breadth of brain-case 5·9 ; palato-sinual length 4·2 ; front of canine to back of m^3 3·6 ; front of p^4 to back of m^2 2·2 ; three lower molars 2·5.

Hab. and *Type* as above.

This little bat would seem to be readily distinguishable from the other small species of the genus by its pale colour and unicuspid upper incisors.

5. *Crocidura* sp.

♀. 8. Panyam, 4000′.

Near *C. manni*, Pet.

6. *Crocidura* sp.

♂. 5. Panyam, 4000′.

Near *C. soricoides*, Murr.

7. *Taterillus nigeriæ*, sp. n.

♂. 105. Kabir, 2700′. Collected 7th June, 1910. B.M. no. 11. 3. 24. 14. *Type*.

A large dark species, with heavily tufted tail.

Size about as in the geographically near *T. lacustris*, Thos. & Wrought., but colour conspicuously darker, much as in *T. butleri*, Wrought. Top of head and dorsal area with the usual gerbilline colour much darkened, cheeks and flanks light sandy ; belly, as usual, pure white. Light markings above eyes scarcely perceptible. Ears brown. Soles with the characteristic band of hairs across them very strongly marked. Tail long, heavily tufted for its terminal half, the hairs of the tuft attaining 11 mm. in length, its upper surface and whole of the tuft dark brown, its sides and under surface proximally strong buffy.

Skull very like that of *T. lacustris*, but slightly larger. Anterior palatine foramina rather longer and bullæ a little larger.

Dimensions of the type (measured in flesh) :—

Head and body 125 mm. ; tail 190 ; hind foot 33 ; ear 22.

Skull : greatest length 37·3 ; condylo-incisive length 32·2 ;

zygomatic breadth 18·2; breadth of brain-case 15·3; anterior palatine foramina 7·2; posterior palatine foramina 4·3; upper molar series 5·4.

Hab. and *Type* as above.

This gerbil is most like the Soudanese *T. butleri*, Wrought., being distinguished from *T. gracilis* by its greater size and from *T. lacustris* by its darker colour, these being the only West-African species hitherto known.

The Museum also contains a young specimen of the same species collected at Yola by Mr. G. W. Webster.

8. *Arvicanthis mordax*, sp. n.

♂. *3*, 11 (young); ♀. 12. Panyam, 4000′.

Near *A. rufinus*, Temm., but greyer and teeth larger.

Size large, as in *A. rufinus*. General colour decidedly greyer than in *rufinus*, the head and fore-back more buffy than "drab-grey," the tips of the hairs cream-buff, their blackish slaty bases showing through. Hind-back and rump gradually approaching "russet." Base of tail russet. Under surface dull greyish, the tips of the hairs varying from greyish white to drab. Hands and feet dull buffy. Tail more heavily haired than in *rufinus*; blackish above, buffy on sides and below.

Skull very similar to that of *A. rufinus*, but somewhat greater in zygomatic spread, the length being about the same.

Incisors, as in *A. rufinus*, very broad and heavy. Molars markedly broader than in that species.

Dimensions of the type (measured in flesh) :—

Head and body 164 mm.; tail 147; hind foot 34; ear 22.

Skull: greatest length 40; condylo-incisive length 38·2; zygomatic breadth 20·3; nasals 15·3; interorbital breadth 6·1; palatilar length 18·3; palatal foramina 8·2; upper molar series 7·6; breadth of m^1 2·4.

Hab. as above.

Type. Old female. B.M. no. 11. 3. 24. 11. Original number 12. Collected 14th September, 1910.

This is no doubt the N.-Nigerian representative of *A. rufinus*, from which it differs by its greyer colour and larger molars.

A specimen of it, without skull, was also obtained during the Alexander-Gosling Expedition by the late Capt. Boyd Alexander at Ibi, on the Benue, in 1904.

9. *Arvicanthis striatus venustus*, subsp. n.

♂. 1. Panyam, 4000′. B.M. no. 11. 3. 24. 13. Collected 2nd May, 1910. *Type.*

A pale form of the *A. striatus* * group.

Size about as in *A. pulcher*, Wrought., whose distinctness from *pulchellus* I am disposed to doubt. General colour very pale, the ground-colour between "clay-colour" and "raw umber," the light punctated stripes less conspicuous than usual. Under surface dull whitish, not sharply defined laterally. Median black dorsal line strong and well defined as usual. Sides of muzzle and a spot above each eye buffy. Ears with their proctotc brown, metentote dull ochraceous; a tuft at their anterior bases and a small patch behind them deep ochraceous. Hands and feet dull buffy white. Tail brown above, dull whitish below.

Skull very like that of the type of *A. pulcher*, but the molars rather larger.

Dimensions of the type (measured in flesh):—

Head and body 119 mm.; tail 140; hind foot 28.

Skull: greatest length 32; condylo-incisive length 29·3; greatest breadth 15·5; nasals 12·6; interorbital breadth 6; palatilar length 14; palatal foramina 6·3; upper molar series 5·6.

Hab. and *Type* as above.

Quite distinct from any known form of the *striatus* group by its pale colour and less conspicuous striping.

10. *Epimys jacksoni viator*, subsp. n.

♂. 6; ♀. 7. Panyam, 4000′.

Quite like true Central African *jacksoni*, but the colour markedly paler.

General colour of upper surface pale rufous fawn, darker and more rufous than "clay-colour." Sides dark pinkish buff. Belly white, the bases of the hairs slaty grey.

Dimensions of the type (measured in flesh):—

Head and body 109 mm.; tail 167; hind foot 26; ear 20.

Skull: greatest length 32; condylo-incisive length 28·8; nasals 12·2; interorbital breadth 4·6; palatal foramina 7·5; upper molar series 5·1.

Hab. as above.

* *Cf.* P. Z. S. 1911, p. 148. Sierra Leone specimens, however, will be needed for comparison with the types of *pulcher* and *pulchellus* before the mutual relationships of the three can be made out.

Type. Old female. B.M. no. 11. 3. 24. 18. Original number 6. Collected 12th May, 1910.

The discovery of *E. jacksoni* in West Africa is somewhat of a surprise, but I can find no character of importance to distinguish the Nigerian form from that inhabiting Uganda, some 1700 miles distant. The paler colour is a natural result of the more desert conditions obtaining in Nigeria.

11. *Epimys* sp.

♂. 2. Panyam.

Multimammate group.

12. *Epimys* sp. (?).

♀. 101 (skull lost). Kabir, 2700′.

A white-bellied species; perhaps allied to *E. daltoni*, Thos.

13. *Acomys* sp.

♂. 102. Kabir, 2700′.

The specimen has unfortunately no skull, so that I do not at present attempt to determine it.

14. *Georychus foxi*, sp. n.

♀. 13. Panyam, 4000′. Collected 22nd October, 1910. B.M. no. 11. 3. 24. 19. *Type.*

A dark-coloured species of medium size.

Size rather smaller than in the large *G. lechei* and its allies, larger than in the majority of the species. Fur soft and fine; hairs of back about 9 mm. in length. General colour dark, conspicuously different from the light-coloured *G. zechi* of Togoland, nearly as dark as in *G. lechei*; hairs dark slaty (grey no. 4) for four-fifths their length, their tips dark brown (darker than "broccoli-brown"). Underside like upper. Face rather browner; a conspicuous white frontal patch present, but not very large (about 9 × 4 mm. in the type). Hands and feet thinly haired, the hairs pale brown. Tail brown.

Skull much rounded above, though the type appears to be adult. Nasals broadened in the middle and only slightly narrowed posteriorly, not running back to a point; premaxillary processes surpassing nasals posteriorly by rather less than 2 mm. Anteorbital foramina small.

Incisors much thrown forward, their front face not be-

coming vertical terminally. Last molar disproportionately smaller than the other cheek-teeth.

Dimensions of the type (measured in flesh) :—

Head and body 143 mm.; tail 13; hind foot 28.

Skull : condylo-basal length 37·6 ; condylo-incisive length 39·6 ; zygomatic breadth 28·7 ; nasals 16×4·7 ; interorbital breadth 10·8 ; palatilar length 22·6 ; upper molar series (crowns) 6·8.

Hab. and *Type* as above.

This interesting rodent-mole, which I have named in honour of the donor of the collection, is widely different from any described species, as is, indeed, to be expected from its locality. Perhaps its nearest ally is the *G. lechei* of Monbuttu, but that is considerably larger. The only other West-African species, *G. zechi*, of Togoland, is a very pale animal, while *G. foxi* is one of the darkest species of the genus.

LIV.—*Descriptions of Thirty-six new Species of Land and Freshwater Shells from British East Africa, chiefly from Mount Kenia and the neighbouring District.* By H. B. Preston, F.Z.S.

[Plates XI. & XII.]

Ennea consobrina, sp. n. (Fig. 1.)

Allied to *E. unilirata*, Smith *, which also occurred at the same locality, but differing from that species in its larger, more solid, and more cylindrical form, the later whorls in the present species not decreasing in size, its coarsely striate sculpture, broader and more rectangular aperture, and thick rather broadly reflexed labrum ; moreover it has one whorl more, the whorls are flatter, and the suture is shallower.

Alt. 4·25, diam. maj. 2·25 mm.

Aperture : alt. 1, diam. ·75 mm.

Hab. Mount Kenia, at an altitude of 9000–10,000 feet, British East Africa.

Ennea iota, sp. n. (Fig. 2.)

Shell minute, ovately pyramidal, thin, white; whorls 5, regularly increasing, the last ascending in front, sculptured

* J. Conch. x. p. 315.

with rather coarse, very oblique, transverse striæ; suture somewhat deeply impressed; labrum sinuous, white, scarcely reflexed, the margins not joined, though it is continued for some distance along the parietal wall; aperture almost irregularly triangular, furnished with two oblique parietal lamellæ, of which the lower is the coarser, a short lamella on the outer lip, a coarse basal denticle, and a coarse oblique lamella on the columella.

Alt. 1·5, diam. maj. 1 mm.

Hab. Between Rumruti and Mount Kenia, British East Africa.

Ennea keniana, sp. n. (Fig. 3.)

Shell small, ovately cylindrical, white, somewhat polished; whorls 8, the first five rather rapidly increasing, sculptured with obsolete, oblique, transverse striæ, which become more accentuated on the last whorl behind the labrum, the last whorl tri-strangulate; suture impressed; umbilical area excavated, depressed, and finally narrowing to a shallow chink; labrum white, continuous; columella descending rather obliquely; aperture irregularly rectangular, armed with an almost vertical parietal plait, which bifurcates above where it reaches the margin of the peristome, a denticle and below this a lamella on the outer lip, a rather coarse basal erect lamella and an inwardly curved lamella on the columella.

Alt. 3·5, diam. maj. 1·5 mm.

Aperture: alt. ·75, diam. nearly ·5 mm.

Hab. Mount Kenia, at an altitude of 6000–8000 feet, British East Africa; a single specimen was also taken in the lower country between Rumruti and Mount Kenia.

Ennea optata, sp. n. (Fig. 4.)

Shell cylindrically ovate, moderately solid, whitish, polished, shining; whorls $7\frac{1}{2}$, flat, the earlier whorls rather rapidly increasing, the later very slowly increasing, marked with transverse arcuate striæ, which become finer on the later whorls, and very fine wavy spiral striæ, the last whorl bi-strangulate behind the labrum; suture linear; umbilical area shallowly excavated, but without regular perforation; labrum white, thickened, reflexed; aperture irregularly subquadrate, armed with a rather crookedly curved parietal lamella on the right side, a somewhat coarse lamella situate between two denticles on the inner margin of the outer lip, a basal tooth-like lamella and a broad bifurcate lamella on the columella.

Alt. 10·75, diam. maj. 5·5 mm.

Aperture: alt. 2·5, diam. 2 mm.

Hab. Mount Kenia, at an altitude of 6000–8000 feet, British East Africa.

Ennea pilula, sp. n. (Fig. 5.)

Shell ovate, imperforate, solid, yellowish white, slightly polished; whorls $7\frac{1}{2}$, the apical whorls exserted, smooth, the third, fourth, and fifth gradually increasing, the sixth and seventh flat and about of the same breadth, all the later whorls from the beginning of the third onward sculptured with transverse arcuate striæ, which become obsolete on the middle and lower portions of the last whorl, the last whorl tri-strangulate behind the labrum; suture linear; umbilical area presenting a shallow elongate depression; columella almost vertically descending; labrum white, thickened, broadly expanded, reflexed, a coarse white parietal callus joining the margins; aperture roughly quadrilateral, armed with a coarse, broad, bifid, reflexed, subparietal lamella, below which occur on the inner margin of the outer lip three plaits, the upper of which forms a canal with the subparietal lamella; below these and at the base of the aperture occurs a fourth plait, and above this on the columella are situate three more plaits, of which the middle one is the strongest, and again above these two denticles.

Alt. 11·25, diam. maj. 6·5 mm.

Aperture: alt. 2·5, diam. 1·75 mm.

Hab. Mount Kenia, at an altitude of 6000–8000 feet, British East Africa.

Ennea pretiosa, sp. n. (Fig. 6.)

Shell ovate, rimate, thin, whitish when in dead condition; whorls 7, the first four rapidly increasing, the sixth the largest, apical whorl smooth, the remainder sculptured with distant, thin, erect, transverse costulæ, between which occur coarse transverse striæ; suture rather deeply impressed; umbilicus wide above, suddenly becoming very narrow and deep below; labrum almost continuous, white, expanded, reflexed, folded above, and turned downwards into a strong, parietal, obtusely angular lamella, bearing a nodule on either side of the angle; aperture irregularly ovate, armed with a short, lamelliform tubercle on the outer lip; a broad, basal denticle, above which occur two denticles, on the columella, of which the lower is the larger.

Alt. 4·5, diam. maj. 2·5 mm.

Aperture: alt. 1, diam. ·5 mm.

Hab. Between Rumruti and Mount Kenia, British East Africa; specimens were also taken on Mount Kenia itself at an altitude of from 6000–8000 feet.

The sculpture of the species is very beautiful, and under a lens recalls that of some of the more distantly costulate *Scalariæ*.

Ennea princei, sp. n. (Fig. 7.)

Shell cylindrically ovate, perforate, cream-coloured; whorls 7, the first five rapidly increasing, the last ascending in front, closely obliquely transversely striate; suture impressed; umbilicus moderately narrow, deep; peristome nearly continuous, white, narrowly reflexed; aperture irregularly rectangular, armed with an almost vertical parietal lamella; a large projecting denticle on the outer lip, opposite which is situate a similar denticle of about equal size on the columella.

Alt. 4, diam. maj. 2·25 mm.

Aperture: alt. 1, diam. nearly ·75 mm.

Hab. Mount Kenia, at an altitude of 9000–10,000 feet, British East Africa.

Ennea simplicima, sp. n. (Fig. 8.)

Shell cylindrical, very thin, almost membranaceous, perforate, pale greenish white; whorls 6, the first four rapidly increasing, transversely striate, the striæ becoming obsolete on the later whorls; suture well impressed; umbilicus very narrow, nearly concealed by the outward expansion of the columella; columella descending obliquely, a thin white callus joining it with the lip above; labrum thin, white, scarcely reflexed; aperture broadly and shortly inversely auriform, *edentulate*.

Alt. 5, diam. maj. 2 mm.

Aperture: alt. 1, diam. ·75 mm.

Hab. Mount Kenia, at an altitude of 9000–10,000 feet, British East Africa.

Thapsia rumrutiensis, sp. n. (Fig. 9.)

Shell perforate, small, depressedly turbinate, moderately solid, dark straw-colour; whorls $3\frac{1}{2}$, rather rapidly increasing, marked with lines of growth, the last angled at the periphery; suture impressed; base of shell somewhat inflated, sculptured

with very fine wavy striæ ; umbilicus very narrow ; columella short, curved ; labrum simple, acute ; aperture broadly sublunate.

Alt. 1·25, diam. maj. 2·5, diam. min. 2·25 mm.

Hab. Between Rumruti and Mount Kenia, British East Africa ; two specimens were also collected at Rumruti on the Laikipia Plateau.

Zingis gaziensis, sp. n. (Fig. 10.)

Shell depressedly turbinate, thin, pale yellowish brown ; whorls $4\frac{1}{2}$, sculptured with coarse, transverse, subplicate lines of growth ; suture impressed ; umbilicus deep ; columella arched, outwardly dilated above ; labrum simple ; aperture rather broadly lunate.

Alt. 4, diam. maj. 7·5, diam. min. 6·5 mm.

Aperture : alt. 3, diam. 2·5 mm.

Hab. Gazi, British East Africa.

Zingis consanguinea, sp. n. (Fig. 11.)

Closely allied to *Z. gaziensis*, but darker in colour, with rather more produced spire and wider umbilicus ; the aperture also is rather more broadly lunate.

Alt. 4·75, diam. maj. 8·25, diam. min. 7 mm.

Aperture : alt. 3·25, diam. 3·5 mm.

Hab. Between Rumruti and Mount Kenia, British East Africa ; also collected on Mount Kenia at from 6000–8000 feet altitude.

Zingis keniana, sp. n. (Fig. 12.)

Shell turbinate, with moderately exserted spire, thin, pale brown, painted with a rather broad band of pale reddish purple just above the periphery ; whorls $5\frac{1}{2}$, regularly increasing, the last rather globose, marked with growth-ridges and sculptured with very fine, closely set, silky, oblique, transverse and fine, spiral striæ ; suture impressed, somewhat wrinkled below ; base of shell spirally striate ; umbilicus very narrow, deep, overhung by the expansion of the columella ; columella descending in a curve, outwardly expanded and diffused into a polished, granular, spirally striate, parietal callus which reaches the lip above ; labrum simple ; aperture broadly sublunate.

Alt. 10, diam. maj. 14·25, diam. min. 12·5 mm.

Aperture : alt. 7, diam. 6 mm.

Hab. Mount Kenia, at an altitude of 9000–10,000 feet, British East Africa.

Trachycystis planulata, sp. n. (Fig. 13.)

Shell depressedly suborbicular, with nearly planulate spire, perforate, thin, horny, pale olivaceous; whorls $4\frac{1}{2}$, rather rapidly increasing, the last descending in front, angled at the periphery, marked with coarse, oblique, somewhat arcuate, transverse riblets; suture well impressed; base of shell slightly convex; umbilicus moderately wide, deep; columella descending in a very oblique curve; labrum thin, narrowly reflexed; aperture broadly sublunate.

Alt. 5·25, diam. maj. 11, diam. min. 9 mm.

Aperture: alt. 5, diam. 5·5 mm.

Hab. Mount Kenia, at an altitude of 9000–10,000 feet, British East Africa.

Trachycystis pseudocharopa, sp. n. (Fig. 14.)

Shell small, suborbicular, depressed, almost planulate, somewhat thin, light brown; whorls $3\frac{1}{2}$, sculptured with rather coarse, closely set, oblique, arcuate costulæ; suture impressed; umbilicus moderately wide, deep; columella vertically descending; labrum simple, acute; aperture broadly sublunate.

Alt. 1·25, diam. maj. 2·5 mm.

Hab. Naivasha, British East Africa.

A pretty little species, forcibly reminding one of some of the New Zealand and Australian *Charopidæ*.

Trachycystis approximans, sp. n. (Fig. 15.)

Very closely allied to *T. pseudocharopa*, but differing in its much finer sculpture and less depressed form, the present species being depressedly turbinate.

Alt. 1·5, diam. maj. 2·5, diam. min. 2 mm.

Aperture: alt. ·5, diam. about ·5 mm.

Hab. Between Rumuruti and Mount Kenia, British East Africa.

Trachycystis rugosa, sp. n. (Fig. 16.)

Shell small, depressedly orbicular, covered with a pale brown periostracum; whorls $3\frac{1}{2}$, regularly increasing, sculptured with distant, rather coarse, transverse costulæ, between which occur fine, closely-set, transverse striæ; suture deeply impressed; base of shell slightly inflated; umbilicus wide, deep; columella obliquely descending, a callus joining it with the lip above; labrum simple; aperture subcircular.

Alt. 1·5, diam. maj. 2·75, diam. min. 2·25 mm.

Aperture: alt. ·5, diam. ·5 mm.

Hab. Mount Kenia, at an altitude of 9000–10,000 feet, British East Africa.

Acanthinula expatriata, sp. n. (Fig. 17.)

Shell globosely turbinate, with elevated spire, thin, covered with a shining pale bronze periostracum, which is raised on the later whorls into rather distant, regular, very oblique ridges, each ridge bearing a coarse, long, broad-based, membranaceous bristle at the periphery; whorls 4, rapidly increasing, convex; suture deeply impressed; base of shell convex, showing traces of very fine, spiral sculpture between the ridges of the periostracum; umbilicus narrow, very deep, partly concealed by the expansion of the outer margin of the columella; columella descending in an oblique curve and diffused above into a whitish, parietal callus, both it and the labrum white, slightly reflexed and outwardly broadly surrounded by a reflexed extension of the membranaceous periostracum, thus forming a double margin; aperture subcircular.

Alt. nearly 2·5, diam. maj. 2 mm.

Hab. Mount Kenia, at an altitude of 9000–10,000 feet, British EastAfrica.

Rachis virginea, sp. n. (Fig. 18.)

Shell acuminately ovate, thin, the earlier whorls flesh-coloured, the later whorls cream-coloured, occasionally spotted with reddish purple; whorls 5½, rather flat, the last angulate at the periphery, marked with transverse growth lines and very fine, spiral striæ, these latter becoming more marked on the base of the shell; suture impressed; columella obliquely outwardly curved below, reflexed and expanded into a thin callus; peristome simple; aperture ovate.

Alt. 14, diam. maj. 9·5, diam. min. 7 mm.

Aperture: alt. 7·5, diam. 4·5 mm.

Hab. Mount Kenia, at an altitude of 6000–8000 feet, British East Africa.

Rachis turricula, sp. n. (Fig. 19.)

Shell elongately turrite, perforate, thin, corneous, polished, pale yellowish brown; whorls 7, the last two rather rapidly increasing, marked with fine, oblique lines of growth; suture impressed; umbilicus very narrow; columella vertically

descending, outwardly reflexed round the narrow perforation; aperture inversely auriform.

Alt. 10, diam. maj. 5 mm.

Aperture: alt. 5, diam. 2·5 mm.

Hab. Between Rumruti and Mount Kenia, British East Africa.

Cerastus nobilis, sp. n. (Fig. 20.)

Shell acuminately ovate, scarcely rimate, somewhat solid, dark flesh-coloured, shading to a paler hue on the last whorl; whorls 6, rapidly increasing, the apical whorls smooth, the remainder decussately sculptured with fine, spiral and transverse striæ, the upper whorls also being rather coarsely obliquely transversely striate, and the last coarsely malleated; suture impressed, slightly crenellate; columella rather vertically descending, outwardly expanded above, a faint polished callus joining it with the margin of the labrum; labrum thickened, outwardly expanded, reflexed, tinged with pale reddish brown; aperture inversely auriform; interior of shell rich reddish brown.

Alt. 30, diam. maj. 21, diam. min. 17·5 mm.

Aperture: alt. 13·5, diam. 8·5 mm.

Hab. Mount Kenia, at an altitude of 6000–8000 feet, British East Africa.

Jaminia desiderata, sp. n. (Fig. 21.)

Shell small, turbinate, with very obtuse apex, reddish brown; whorls $5\frac{1}{2}$, rather slowly increasing, moderately convex, the last ascending in front; suture well impressed; umbilicus broad, somewhat deep, partly concealed by the reflexion of the columellar margin; columella descending very obliquely, bearing rather interiorly a single plait; labrum whitish, sinuous, reflexed, projecting inwardly at a point some little distance below its junction with the parietal wall, which bears a weak, very oblique lamella; aperture irregularly quadrate.

Alt. 3, diam. maj. 2 mm.

Aperture: alt. ·75, diam. ·5 mm.

Hab. Mount Kenia, at an altitude of 9000–10,000 feet, British East Africa.

Fauxulus duplicatus, sp. n. (Fig. 22.)

Shell small, sinistral, cylindrically ovate, rimate, brown; whorls 5, the first four regularly increasing, the last ascending

in front, having a somewhat weathered appearance; suture well impressed; umbilicus reduced to a narrow chink; columella descending in a curve; labrum continuous, white, slightly reflexed, obtusely angled above on the outer side; aperture roundly ovate, armed with two short, erect, parietal lamellæ placed the one almost above the other, the lower of which is very interiorly situate, a tubercular lamella on the columella and a sub-basal lamella on the outer lip, above which, and well inside the shell, occurs a small denticle.

Alt. 3·25, diam. maj. 1·75 mm.

Aperture: alt. 1, diam. ·5 mm.

Hab. Between Rumruti and Mount Kenia, British East Africa.

Clausilia degeneris, sp. n. (Fig. 23.)

Shell small, thin, cylindrically subulate, brown, streaked with greyish white; whorls 7, somewhat convex, sculptured with fine, oblique, closely set, silky, transverse striæ; suture well impressed; columella whitish, arched, bearing on the upper portion a single erect lamella almost at right angles; labrum continuous, whitish, slightly thickened, scarcely reflexed; aperture ovate.

Alt. 6·25, diam. maj. 1·5 mm.

Aperture: alt. 1, diam. ·5 mm.

Hab. Between Rumruti and Mount Kenia, British East Africa.

A small degenerate form which almost marks the southern limit of the genus on the African continent.

Rebmanniella, sec. nov.

Shell having broad, blunt, apical whorls and columella almost truncate.

Type of section, *R. inepta*.

Limicolaria (*Rebmanniella*) *inepta*, sp. n. (Fig. 24.)

Shell fusiform, rather solid, the earlier whorls painted with transverse slate-coloured flame-markings, the later whorls brownish yellow, stained, streaked, and blotched with greyish brown; whorls $6\frac{1}{4}$, decussately sculptured throughout with spiral striæ and transverse riblets; suture impressed, slightly crenellate, margined below; columella descending nearly vertically, diffused above into a thin polished callus, which reaches the margin of the labrum, almost truncate below; labrum simple, acute, somewhat receding above and below;

aperture rather narrowly inversely auriform; interior of shell pale bluish white, polished, nacreous.

Alt. 58, diam. maj. 27, diam. min. 24 mm.

Aperture: alt. 21, diam. 14 mm.

Hab. Mount Kenia, at an altitude of 6000–8000 feet, British East Africa.

I am inclined to include in this section *Limicolaria dohertyi*, Smith *, from Uganda, and also *Limicolaria keniana*, Smith †, from Mount Kenia.

KRAPFIELLA, gen. nov.

Shell bulimiform, perforate, with *apical whorls large, broad, and sculptured with spiral striæ*, the later whorls marked only with transverse wrinkles; columella *not* truncate.

Type of genus, *K. mirabilis*.

Krapfiella mirabilis, sp. n. (Figs. 25 A, 25 B.)

Shell elongately ovate, rather thin, yellowish brown; whorls $5\frac{1}{2}$, the apical whorls closely but coarsely spirally striate, the later whorls sculptured with transverse riblets; suture well impressed, somewhat crenellate; umbilicus narrow, deep, partly concealed by the outward expansion of the columella; columella glassy, slightly oblique, outwardly expanded; peristome simple; aperture inversely auriform.

Alt. 23·5, diam. maj. 13, diam. min. 11 mm.

Aperture: alt. 10·25, diam. 5·5 mm.

Hab. Mount Kenia, at an altitude of 6000–8000 feet, British East Africa.

Homorus egregius, sp. n. (Fig. 26.)

Shell subulate, glossy, polished, shining, yellowish olive; whorls 11, somewhat convex, marked with transverse growth striæ; suture well impressed, somewhat crenellate; columella curved, obliquely truncate below, a light well-defined callus extending from it to the margin of the labrum above; labrum simple; aperture elongately inversely auriform.

Alt. 51·75, diam. maj. 18, diam. min. 11 mm.

Aperture: alt. 13, diam. 5·5 mm.

Hab. Mount Kenia, at an altitude of 6000–8000 feet, British East Africa.

Curvella deliciosa, sp. n. (Fig. 27.)

Shell ovately fusiform, thin, vitreous, pale greenish white;

* J. Malac. viii. p. 95. † J. Conch. x. p. 318.

whorls 4½, the first three and a half regularly increasing, the last large, the apical whorls smooth, the later whorls beautifully sculptured with fine, glassy, regularly distant, arcuate costulæ; suture well impressed; columella almost vertically descending, stained with pale reddish chestnut, a moderately thick well-defined parietal callus joining it with the lip above; labrum simple, acute, receding above and below; aperture elongately inversely auriform.

Alt. 6·5, diam. maj. 3·5 mm.

Aperture: alt. 3·5, diam. 1·75 mm.

Hab. Mount Kenia, at an altitude of 9000–10,000 feet, British East Africa.

KENIA, subgen. nov.

Shell subulate, transversely striate, with oblique truncate columella, the later whorls, and especially the last, much elongated; aperture receding at base.

Type of subgenus, *Kenia suturalis*.

Kenia suturalis, sp. n. (Fig. 28.)

Shell subulate, thin, semitransparent, polished, shining, yellowish olive; whorls 7, the last two flattish and more elongate in proportion to the remainder, the upper whorls sculptured with oblique transverse striæ, which become less marked on the later whorls; suture impressed, ornamented with a narrow, cream-coloured, sublateral, marginal band on which the terminations of the transverse striæ are very apparent; columella descending in a very pronounced curve, obliquely truncate below, diffused outwards and above into a thin whitish callus which reaches the upper margin of the labrum; labrum simple, acute, receding below; aperture inversely auriform.

Alt. 29·5, diam. maj. 8·5, diam. min. 8 mm.

Aperture: alt. 8·5, diam. 4·5 mm.

Hab. Mount Kenia, at an altitude of 9000–10,000 feet, British East Africa.

Subulina dohertyi *, Smith, from Uganda, specimens of which also occurred on Mount Kenia at from 6000–8000 feet, may perhaps also be included in the present subgenus.

Kenia iredalei, sp. n. (Fig. 29.)

Shell subulate, whitish, covered with a golden-brown

* J. Conch. x. p. 319.

periostracum ; whorls 7, moderately flat, marked only with lines of growth ; suture impressed ; columella somewhat curved, abruptly truncate ; labrum simple, receding below ; aperture inversely auriform.

Alt. 16·75, diam. maj. 4·5 mm.

Aperture : alt. 4·5, diam. 2 mm.

Hab. Mount Kenia, 6000–8000 feet, British East Africa.

Opeas orestias, sp. n. (Fig. 30.)

Shell fusiform, yellowish white, thin, rimate, with obtuse and rather large apex ; whorls $5\frac{1}{2}$, convex, the first one and a half smooth, the remainder sculptured with somewhat coarse transverse riblets ; suture deeply impressed ; perforation reduced to a mere chink ; columella descending obliquely, reflexed ; labrum acute, simple ; aperture elongately ovate.

Alt. 4 mm., diam. maj. 2 mm.

Aperture : alt. 1, diam. nearly ·5 mm.

Hab. Mount Kenia, at an altitude of 9000–10,000 feet, British East Africa.

Opeas terebra, sp. n. (Fig. 31.)

Shell elongately subulate, shining, yellowish white, thin ; whorls $10\frac{1}{2}$, the apical whorls smooth, submammillary, the remainder flattish, sculptured with fine, transverse, arcuate costulæ ; suture impressed, rather coarsely crenellated by the terminations of the transverse costulæ ; columella thickened, descending in a slight curve ; labrum white, slightly reflexed ; aperture inversely auriform.

Alt. 12·5, diam. maj. 2·75 mm.

Aperture : alt. 2·25, diam. 1 mm.

Hab. Between Rumruti and Mount Kenia, British East Africa.

Opeas rumrutiensis, sp. n. (Fig. 32.)

Shell rather shortly subulate, thin, semitransparent, wax-coloured, with rather blunt apex ; whorls 6, slightly convex, sculptured with transverse, arcuate, somewhat closely-set costulæ ; suture impressed, margined below ; columella vertically descending, narrowly reflexed ; labrum simple ; aperture inversely auriform.

Alt. 6, diam. maj. 2, diam. min. 1·75 mm.

Aperture : alt. 1·75, diam. ·5 mm.

Hab. Between Rumruti and Mount Kenia, British East Africa.

Opeas angustior, sp. n. (Fig. 33.)

Shell differing from *O. rumrutiensis* in its rather narrower form and more acuminate apex, in having an additional whorl and a half, coarser transverse sculpture, crenellate and not margined suture, more obliquely descending columella, and shorter aperture.

Alt. 7·25, diam. maj. nearly 2 mm.

Aperture: alt. 1·25, diam. ·5 mm.

Hab. Between Rumruti and Mount Kenia, British East Africa.

Opeas vicina, sp. n. (Fig. 34.)

Shell differing from *O. angustior* in its shorter and more tapering form, rather more convex whorls, of which there are but six, coarser sculpture, rather less oblique columella, and shorter aperture.

Alt. 5·25, diam. maj. 1·75, diam. min. 1·5 mm.

Aperture: alt. 1, diam. ·5 mm.

Hab Between Rumruti and Mount Kenia, British East Africa.

Ancylus crassistriatus, sp. n. (Fig. 35.)

Shell somewhat conical, oval, with subcentral apex, chocolate-brown in colour, sculptured with coarse, wavy, radiate striæ; margin somewhat serrated; interior reddish brown, polished, shining.

Alt. 2, diam. maj. 4·5, diam. min. 3 mm.

Hab. Between Rumruti and Mount Kenia, British East Africa.

Pisidium kenianum, sp. n. (Fig. 36.)

Shell solid, somewhat trigonal, convex, very finely concentrically striate; umbones large; dorsal margin arched; ventral margin rounded; anterior side rather abruptly descending; posterior side slightly produced, rounded; cardinal teeth in right valve small, oblique; anterior lateral elongate, erect; posterior lateral also elongate, slightly rounded; cardinal teeth in left valve situated at an obtuse angle to one another, the anterior broad below, the posterior small; the anterior lateral in left valve posteriorly bifid, angled in the middle, outwardly projecting; the posterior lateral elongately anteriorly bifid, also projecting, slightly grooved above.

Long. 3·75, lat. 4 mm.

Hab. Between Rumruti and Mount Kenia, British East Africa; a few specimens were also collected on Mount Kenia at an altitude of from 9000–10,000 feet.

Mr. B. B. Woodward, who has very kindly examined this species for me, informs me that it in some measure resembles the *P. supinum*, A. Schmidt, of North-western Europe.

EXPLANATION OF THE PLATES.

Plate XI.

Fig. 1. *Ennea consobrina*, sp. n.
Fig. 2. —— *iota*, sp. n.
Fig. 3. —— *keniana*, sp. n.
Fig. 4. —— *optata*, sp. n.
Fig. 5. —— *pilula*, sp. n.
Fig. 6. —— *pretiosa*, sp. n.
Fig. 7. —— *princei*, sp. n.
Fig. 8. —— *simplicima*, sp. n.
Fig. 9. *Thapsia rumrutiensis*, sp. n.
Fig. 10. *Zingis gaziensis*, sp. n.
Fig. 11. —— *consanguinea*, sp. n.
Fig. 12. —— *keniana*, sp. n.
Fig. 13. *Trachycystis planulata*, sp. n.
Fig. 14. —— *pseudocharopa*, sp. n.
Fig. 15. —— *approximans*, sp. n.
Fig. 16. —— *rugosa*, sp. n.
Fig. 17. *Acanthinula expatriata*, sp. n.
Fig. 18. *Rachis virginea*, sp. n.
Fig. 19. —— *turricula*, sp. n.
Fig. 20. *Cerastus nobilis*, sp. n.
Fig. 21. *Jaminia desiderata*, sp. n.
Fig. 22 *Fauxulus duplicatus*, sp. n.
Fig. 23. *Clausilia degeneris*, sp. n.

Plate XII.

Fig. 24. *Limicolaria* (*Rebmanniella*) *inepta*, sp. n.
Fig. 25 A. *Krapfiella mirabilis*, sp. n.
Fig. 25 B. —— ——. Apex, enlarged.
Fig. 26. *Homorus egregius*, sp. n.
Fig. 27. *Curvella deliciosa*, sp. n.
Fig. 28. *Kenia suturalis*, sp. n.
Fig. 29. —— *iredalei*, sp. n.
Fig. 30. *Opeas orestias*, sp. n.
Fig. 31. —— *terebra*, sp. n.
Fig. 32. —— *rumrutiensis*, sp. n.
Fig. 33. —— *angustior*, sp. n.
Fig. 34. —— *vicina*, sp. n.
Fig. 35. *Ancylus crassistriatus*, sp. n.
Fig. 36. *Pisidium kenicnum*, sp. n.

LV. — *Descriptions of Three new Species of Freshwater Fishes from South Africa.* By J. D. F. Gilchrist, D.Sc., and W. Wardlaw Thompson, F.Z.S.

Labeo seeberi, sp. n.

Depth of body nearly 5 times in total length, excluding caudal, length of head $4\frac{1}{2}$ times; width of head nearly $\frac{3}{5}$ its length; snout prominent, projecting, rounded and slightly pointed, longer than postocular part of head and $2\frac{1}{10}$ times in length of head; eye lateral, nearer to gill-opening than to point of snout, 7 times in length of head, $3\frac{1}{5}$ times in interorbital width; width of mouth, with lips, a little more than $\frac{1}{2}$ length of head; lips well-developed, with transverse plicæ on inner surface, fringed with papillæ; the lower lip with prominent papillæ scattered on it and festooned on lower edge; rostral flap fringed; no barbel visible.

Dorsal IV 9, nearly equidistant from nostrils and base of caudal, upper border emarginate; longest branched ray about $\frac{4}{5}$ length of head. Anal III 5, does not reach to base of caudal. Pectoral $\frac{4}{5}$ length of head, does not reach to ventral, which is inserted below 4th branched ray of dorsal. Caudal deeply forked, the lower lobe pointed and longer than upper; caudal peduncle nearly twice as long as deep. Scales 83, lat. tr. $\frac{20}{20}$; 16 rows of scales between lateral line and root of ventral, about 32 rows round caudal peduncle.

Colour (of preserved specimen) dark bluish brown above, light coloured on belly; body covered with minute dark specks.

One specimen, 268 mm. in length, from Olifant's River, Transvaal (*Dr. Seeber*).

Varicorhinus nasutus, sp. n.

(Morobe.)

Depth of body $3\frac{3}{10}$ times in total length excluding caudal, length of head $4\frac{3}{10}$ times; width of head about $\frac{2}{3}$ its length. Snout pointed and prominent, shorter than postocular portion of head; eye lateral, 7 times in length of head and $3\frac{1}{2}$ times in interorbital width; width of mouth $\frac{4}{9}$ length of head; rostral flap pointed and overlaps symphysis of upper jaw; a double row of papillæ behind premaxillary; two barbels on each side, the lower longer than the upper and $\frac{4}{5}$ diameter of eye.

Dorsal IV 9, outer border of fin slightly emarginate, no ossified ray, the longest branched ray about $\frac{9}{10}$ length of head; the anterior rays, from 4th to 6th, have a skinny flap on each side along the greater part of their posterior edge. Anal III 5, similar to dorsal, reaches base of caudal. Pectoral a little more than $\frac{4}{5}$ length of head and not reaching to ventral, which is inserted below posterior half or middle of dorsal. Caudal forked; depth of caudal peduncle $1\frac{1}{3}$ times in its length. Scales 30, lateral line very indistinct anteriorly and marked on posterior half of body by small round holes, lat. tr. $\frac{5}{7}$; 3 rows of scales between lateral line and base of ventrals, 12 rows round caudal peduncle. The scales on the body are very large, those below posterior margin of dorsal being the largest and more than twice diameter of eye; the scales on the belly are much smaller; head entirely scaleless.

Colour (of preserved specimen) bluish above, flesh-coloured below.

One specimen, 482 mm. in length, from gorge below Victoria Falls, Zambesi River (*F. W. Sykes*).

Varicorhinus nelspruitensis, sp. n.

Body compressed, depth $3\frac{2}{5}$ to 4 times in total length excluding caudal, length of head $4\frac{1}{2}$ to $4\frac{3}{5}$ times, width of head $\frac{3}{5}$ to $\frac{2}{3}$ its length; snout prominent, rounded, shorter than postocular portion of head; eye lateral, $4\frac{3}{5}$ to $4\frac{4}{5}$ times in length of head and about twice to $2\frac{2}{5}$ times in interorbital width; width of mouth about $\frac{1}{2}$ length of head; no barbel; small tubercles on snout; mouth feebly curved.

Dorsal III 8–9, upper edge slightly emarginate, no ossified ray, longest branched ray $\frac{4}{5}$ to about same length as head. Anal II 5, similar to dorsal, does not reach base of caudal. Pectoral $\frac{4}{5}$ to about same length as head, does not reach ventral, which is inserted below 2nd branched ray of dorsal. Caudal forked, the lobes pointed; caudal peduncle $1\frac{1}{5}$ times to twice as long as deep. Scales 34–35, lat. tr. $\frac{5\frac{1}{2}-6}{6-6\frac{1}{2}}$; $2\frac{1}{2}$ rows of scales between lateral line and base of ventral, 14 rows round caudal peduncle.

Colour (of preserved specimens) bluish black, darker above.

Two specimens, 145 mm. and 158 mm. in length respectively, from Nelspruit, Transvaal.

LVI.—*Notes on Fossorial Hymenoptera.*—IV.

By Rowland E. Turner, F.Z.S., F.E.S.

Remarks on the Genus Palarus.

The following remarks are founded on the specimens of *Palarus* in the National Collection at South Kensington, which I have recently rearranged, and also on the collection of Colonel C. G. Nurse, which he has kindly lent to me for the purpose. The National Collection, though recently much improved by the purchase of the Saunders collection and by specimens from Karachi presented by Mr. Comber, is still poor, especially in species from Asiatic Russia. The species with which I am acquainted, together with a few others which are sufficiently well described, if classified according to the apical abdominal segment of the male, fall into five natural groups:—

I. Seventh dorsal segment bifurcate at the apex.
   1. *P. o'neili*, Brauns; 2. *P. rufipes*, Latr.; 3. *P. variegatus*, Fabr.; 4. *P. spinolæ*, Sauss.; 5. *P. fortistriolatus*, Cam.; 6. *P. affinis*, Moraw.; 7. *P. rothschildi*, Grib.

II. Seventh dorsal segment narrow and truncate or shallowly emarginate at the apex.
   1. *P. indicus*, Nurse; 2. *P. saundersi*, Morice; 3. ? *P. dongalensis*, Klug; 4. ? *P. aurantiacus*, Rad.

III. Seventh dorsal segment tridentate at the apex.
   1. *P. funerarius*, Moraw.; 2. *P. bisignatus*, Moraw.; 3. *P. seraxensis*, Rad.; 4. *P. lætus*, Klug; 5. *P. fabius*, Nurse; 6. *P. lepidus*, Klug; 7. *P. nursei*, Turn.; 8. *P. confusus*, Turn.

IV. Seventh dorsal segment truncate at the apex, with lateral spines at the base.
   1. *P. orientalis*, Kohl; 2. *P. latifrons*, Kohl.

V. Seventh dorsal segment broadly subtruncate at the apex, without lateral spines.
   1. *P. comberi*, Turn.

The third group is also distinguished by the greater distance between the eyes on the vertex. *P. pentheri*, Brauns, seems to form a sixth group.

The genus is isolated among the Sphecoidea, showing no near relationship to any other, and when the group is revised can hardly be associated with the Larridæ. Kohl practically

leaves the genus unclassified, though associating it provisionally with the Larridæ.

Most of the species belong to the Palæarctic and Ethiopian Regions, only one species having been found in the part of India really belonging to the Oriental Region, though seven must now be included in the fauna of British India. The collections of Colonel Nurse and Mr. Comber are particularly interesting, showing that the fauna of Quetta is mainly Palæarctic, while at Karachi and Deesa there is a strong Palæarctic element in a fauna that is mainly Indian, the country between the Rajputana desert and the passes into Beluchistan being a borderland between the two regions.

Palarus variegatus, Fabr.

Tiphia variegata, Fabr. Spec. Insect. p. 451 (1781). ♀.
Crabro flavipes, Fabr. Spec. Insect. p. 470 (1781).
Palarus flavipes, Latr. Gen. Crust. & Insect. i. (1806).

As I have previously pointed out, the name *variegatus* should be used for this species.

Palarus fortistriolatus, Cam.

Palarus fortistriolatus, Cam. Ann. & Mag. Nat. Hist. (7) xx. p. 91 (1907).

This species is nearest to *P. spinolæ*, Sauss., but has the pleuræ more closely punctured. There is no tubercle or lateral spine on the sixth ventral segment of the male.

Palarus indicus, Nurse.

Palarus indicus, Nurse, Journ. Bombay Nat. Hist. Soc. xv. p. 4 (1903).

This is probably a geographical race of *P. dongalensis*, Klug, and is somewhat intermediate between the typical form and *P. aurantiacus*, Rad. Females from Karachi (ex coll. Comber) have the median segment black in the middle, as in Klug's figure, the mesonotum black, with an obscure ferruginous line on each side, and the wings flavo-hyaline at the base. Otherwise the specimens answer well to Radoszkowski's description.

Palarus funerarius, Moraw.

Palarus funerarius, Moraw. Hor. Soc. ent. Ross. xxiii. p. 136 (1889).
Palarus quiescens, Nurse, Journ. Bombay Nat. Hist. Soc. xv. p. 5 (1903).

Hab. Deesa (*Nurse*) ; Karachi (*Comber*) ; Mongolia (*Morawitz*).

Palarus lætus, Klug.

Palarus lætus, Klug, Symbol. physic. (1845). ♂ ♀.
Larra annulata, Walker, List of Hymen. in Egypt, p. 25 (1871). ♂.
Stizus walkeri, Handl. Sitzber. Akad. Wiss. Wien, ci. p. 177 (1892).

A male specimen, evidently named by Walker, is in the British Museum. It answers well to Walker's description, and may possibly be the type.

Palarus fabius, Nurse.

Palarus fabius, Nurse, Bombay Nat. Hist. Soc. xv. p. 6 (1903).

Very near *lætus*, Klug, but the depression on the middle of the median segment is narrower and not so deep, and the transverse ridge on the second ventral segment of the male is much less developed. The scutellum in the male is yellow, as in the female.

Palarus nursei, sp. n.

♂. Niger; mandibulis, clypeo, pronoto linea interrupta, callis humeralibus, macula ante alas, tegulis, mesopleuris macula magna, postscutello, segmentis dorsalibus fasciis transversis, pedibusque flavis; segmento ventrali secundo apice cristato, ano tridentato.

♀. Mari simillima, segmentis abdominis apice fusco-ferrugineis, area pygidiali ferruginea.

♂. Clypeus smooth and shining, very broadly rounded at the apex; a narrow longitudinal carina between the antennæ, obscurely continued on the front, not quite reaching the anterior ocellus. Mandibles strongly notched on the lower margin. Antennæ thickened towards the apex, the second joint of the flagellum distinctly longer than the third, joints 8–13 broader than long. Anterior ocellus large and round, the posterior ocelli much smaller and oval. Eyes separated on the vertex by a distance not quite equal to the length of the second joint of the flagellum. Front and mesonotum minutely punctured and covered with very fine whitish pubescence. Scutellum shining and almost smooth, with a strongly depressed line of deep punctures at the base; mesopleuræ shining and very sparsely punctured. Median segment with a deep and rather broad longitudinal depression in the middle, obliquely striated. First dorsal segment concave at the base, with an elevated carina on each side; first ventral segment with two small tubercles near the middle, beyond which the segment is strongly depressed to the apex;

second ventral segment raised into a broad transverse ridge at the apex; ventral segments 3–6 with an arched carina or raised space before the apex; apical segment tridentate at the apex, the median tooth stouter and slightly longer than the lateral. Appendiculate cell not very distinct; third transverse cubital nervure received very near the apex of the radial cell; second cubital cell with a very short petiole, very broadly triangular, longer on the cubitus than the third cubital cell; first recurrent nervure interstitial with the first transverse cubital nervure.

Black; the mandibles (except at the apex), clypeus, a narrow transverse line above the base of the antennæ, an interrupted line on the pronotum, tegulæ and a spot in front of them, a large vertical spot on the mesopleuræ, post-scutellum, a broad transverse band on each dorsal segment of the abdomen, strongly arcuate in the middle on segments 4–6, the femora (except at the base), tibiæ, and tarsi pale yellow; antennæ fuscous; the apical margins of the dorsal abdominal segments and the ridge at the apex of the second ventral segment fusco-ferruginous. Wings hyaline, nervures pale testaceous.

Length 9 mm.

♀. As in the male, but differs in the absence of tubercles or ridges on the ventral abdominal segments; the pygidial area is smooth, long and narrow, pointed at the apex. The first recurrent nervure is received by the second cubital cell near the base.

The sides of the scutellum and of the median segment and ventral segments 2–4 are marked with yellow. The two basal ventral segments and the pygidium bright ferruginous. Posterior and intermediate legs stained with ferruginous.

Length 9 mm.

Hab. Quetta (*Nurse*); May and June.

Near *P. lepidus*, Klug, but differs in the darker ground-colour of the abdomen; the front is flatter and has a frontal carina instead of a groove, and the scutellum is smoother. In the male the ridge on the second ventral segment is less developed and the first recurrent nervure is differently placed. It is also a less robust species.

Palarus confusus, sp. n.

Very near *P. nursei*, but differs as follows:—

♂. The anterior margin of the clypeus almost transverse; eyes separated on the vertex by a distance equal to the length of the two basal joints of the flagellum, posterior ocelli almost

round, mesonotum and scutellum more closely and distinctly punctured, the depression on the median segment broader anteriorly, abdomen finely and closely punctured instead of almost smooth; the ridge at the apex of the second ventral segment only slightly developed; first recurrent nervure received near the base of the second cubital cell. The yellow bands are confined to the three basal abdominal segments, being replaced on the others by fusco-ferruginous. The wings are very faintly tinged with fuscous.

♀. Differs as in the male, but the eyes are quite as near together on the vertex as in *P. nursei*; the median segment has a large yellow spot on each side near the middle and the pygidial area has a low longitudinal carina and is sparsely but deeply punctured.

Length, ♂ 8, ♀ 9 mm.

Hab. Algeria (*Eaton*), June 1893; ♂ ♀. Aine Kriar, June 1896; ♀.

Ex coll. E. Saunders, in which it was confused with *P. lepidus*, Klug, from which it differs by the frontal characters, the distance between the eyes on the vertex, and otherwise. The male is of slender build, as in *P. nursei*, but the female is robust, as in *P. lepidus*.

The male is the type.

Palarus orientalis, Kohl.

Palarus orientalis, Kohl, Verh. zool.-bot. Ges. Wien, xxxiv. p. 422 (1884).

Hab. Ceylon (*Kohl*); Deesa (*Nurse*).

Two males and one female taken at Deesa by Colonel Nurse (March and April).

The female does not differ from the male in colour. The pygidial area is black, strongly longitudinally striated, broad at the base, rather sharply narrowed near the middle and produced into a point at the apex.

Palarus comberi, sp. n.

♂. Niger; clypeo, mandibulis (apice excepto), tegulis, macula mesopleurarum, fasciisque interruptis segmentorum 1–6 pallide flavis; pedibus flavo-variegatis; alis sordide hyalinis, nervulis testaceis. Pygidium inerme.

Long. 13 mm.

Mandibles with a notch on the outer margin near the middle; clypeus very broadly rounded at the apex, slightly

convex at the base, flattened towards the apex. Eyes separated on the vertex by a very narrow line; the anterior ocellus much larger than the others, which are oval and separated by a longitudinal carina. Antennæ shorter than the mesonotum and scutellum combined, thickened towards the apex, the second joint of the flagellum longer than the first and third combined, the fifth joint as broad as long. Mesonotum finely and rather closely punctured, scutellum shining and almost smooth. Median segment and pleuræ very finely punctured, the median segment with a concave depression rounded posteriorly, a narrow, smooth, triangular area on the posterior truncation, the margins of the area raised into carinæ which converge before the apex of the truncation. Abdomen shining, minutely punctured; the first segment concave-truncate at the base, densely clothed with long greyish-white pubescence on each side of the truncation; the apical half of the second ventral segment very strongly transversely elevated, the basal and apical margins of the elevated portion raised and forming strong carinæ; sixth segment with a small tubercle on each side near the apical angles; seventh dorsal segment rugosely punctured, much longer than broad, subcarinate longitudinally in the middle, slightly depressed and almost truncate at the apex. Radial cell narrowly truncate at the apex, the appendiculate cell not clearly defined, second cubital cell small, with a short petiole, triangular, receiving the second recurrent nervure just before the apex; the first recurrent nervure received by the first cubital cell, separated from the second cubital cell by more than half the length of that cell on the cubital nervure; third transverse cubital nervure not oblique, slightly curved outwards, not nearly reaching the apex of the radial cell.

Black; mandibles (except at the apex), clypeus, a line on each side of the pronotum, tegulæ, a spot on the mesopleuræ, a transverse band on each side on dorsal abdominal segments 1–6, narrowly interrupted in the middle on the second and third segments, more broadly on the others and enclosing a black spot on each side on segments 3–5, a band on the third ventral segment and a spot on each side of the second, and the femora, tibiæ, and tarsi beneath pale yellow. Wings hyaline, stained with pale fulvous at the base, nervures testaceous. Pubescence whitish, very close on the sides of the median segment and on the seventh ventral segment.

♀. As in the male, but without the yellow spot on the mesopleuræ, without the elevated process on the second ventral segment; the sixth dorsal segment long, pointed at

the apex, the sides raised and forming carinæ, within which are two carinæ converging towards the apex and enclosing an inner rugulose area, raised above the lateral margins. The first recurrent nervure is rather nearer to the second cubital cell than in the male.

Hab. Karachi (*E. Comber*), October; ♂ ♀. Deesa (*Nurse*).

The male is the type.

In the almost complete absence of the appendix to the radial cell this species agrees with *latifrons*, Kohl. The second cubital cell is very narrowly triangular, so that the distance between the recurrent nervures is no greater than is usual in the genus, although in this species the first recurrent is received by the first cubital cell. The third cubital cell is almost rectangular. In the form of the apical segment in the male the species is isolated, differing from all others, the dorsal plate being much broader than in *P. saundersi*, Morice, the only other species, so far as I know, in which there are no spines or bifurcation.

P. saundersi may prove to be the male of *dongalensis*, Klug.

LVII.—*Descriptions and Records of Bees.*—XXXVI.

By T. D. A. Cockerell, University of Colorado.

Megachile rufovittata, Ckll.

The United States National Museum contains one of each sex, collected by T. Fukai at Horisha, Formosa. I also find a male in the Sauter collection from the Berlin Museum, collected at Kanshirei, Formosa, June 8, 1908. The male is about 12 mm. long, narrow, with pubescence much as in the female, the abdomen with narrow entire red hair-bands, and some red hair in the basal depressions of the segments, the face with much red hair, the vertex and disc of thorax with a good deal of black hair. The mandibles are quadridentate, the teeth sharp, the second one smaller than the others; antennæ long and black; anterior coxæ with short spines, hidden among the hairs; anterior tibiæ and tarsi simple; sixth abdominal segment retracted, its upper surface granular, elevated in the middle, and with only scattered erect dark hairs in the Kanshirei specimen, but in the other with some appressed pale yellow tomentum in the middle; margin of

sixth segment broadly rounded, strongly notched in the Kanshirei specimen, slightly in the other, not at all dentate; no subapical ventral teeth. The male of *M. rufovittata* has a rather close superficial resemblance to *M. rotundipennis*, W. F. Kirby, from Christmas Island.

Megachile igniscopata, sp. n.

♀.—Length 13 mm.

Closely resembling the Australian *M. pictiventris*, Smith, but with the mesothorax shining, and sparsely punctured in the middle; the shovel-shaped abdomen has distinct metallic purple tints, narrow dull white hair-bands, evanescent in the middle, and ventral scopa bright orange fulvous, with a few slightly fuscous hairs at the apex of the last segment. In Bingham's table of Indian species it runs to *M. chlorigaster*, Cam., a much smaller species. Hair of head and thorax mainly white, dense and with a slight creamy tinge on front, tubercles, and sides of metathorax; on vertex it is black, and on mesothorax, where it is very thin and inconspicuous, largely black, but on scutellum it is all pale; mandibles quadridentate, the third tooth extremely broad; clypeus normal, densely punctured, with a smooth median band, which forms a T with a smooth band along the lower margin of the supraclypeal area; eyes dark reddish; sides of vertex shining, with strong well-separated punctures; antennæ and tegulæ black; scutellum smooth and shining in front, otherwise well punctured. Wings hyaline, strongly and broadly darkened along apical margin; abdomen with small, distinct, well-separated punctures; legs black, with pale hair, that on inner side of tarsi ferruginous; hind basitarsus broad and flat; claws with a basal tooth.

Hab. Takao, Formosa, October 11, 1907 (*Sauter*). Three females in Berlin Museum.

Megachile spissula, sp. n.

♀.—Length 10½ mm.

Black, including legs and antennæ, narrow and parallel-sided, very closely resembling the American *M. subexilis*, Ckll.; pubescence rather dull white, forming very narrow entire bands on the hind margins of the abdominal segments; ventral scopa white, with a slight creamy tint, on the last segment very short and pale reddish. Head oblong, elevated posteriorly; eyes dark brown; mandibles broad, rugose, quadridentate, the teeth short; sides of face with spreading

white hair; clypeus very densely punctured, not keeled, its lower margin in the middle with a pair of small nodules, and projecting between them a tuft of pale orange hair; supraclypeal region elevated, convex, very densely punctured, the punctures running into striæ; front very densely punctured; vertex with extremely large separated punctures; punctures on mesothorax and scutellum large and distinct (but not so large as those on vertex), those on mesothorax more or less running into striæ; area of metathorax granular; hind part of mesothorax with a few hardly noticeable brown hairs; tegulæ piceous. Wings dusky; anterior tibiæ and tarsi with bright ferruginous hair on inner side; hind basitarsi broadened and flattened, with red hair on inner side; spurs light reddish. Abdomen finely but very distinctly punctured, segments 2 to 4 very strongly transversely sulcate, the punctures beyond the sulcus larger than those before.

Hab. Formosa (*Sauter*). One female in Berlin Museum.

In Bingham's table of Indian species this runs to *M. cephalotes*, Smith, which has a quite differently shaped head. The second and third joints of the maxillary palpi are very bristly; the claws have no basal tooth; the last abdominal segment is higher than long, vertically descending until it bends to form the apical lip; these characters, with the narrow form and general structure and appearance, justify the inclusion of *M. spissula* in Robertson's subgenus or genus *Oligotropus*, hitherto known only in the North American fauna.

Megachile tranquilla, sp. n.

♀.—Length 8–9 mm.

Black, with black and white hair, the abdomen with conspicuous narrow entire white hair-bands; ventral scopa white, suffused in the middle with ferruginous, on last segment black; form rather compact; general appearance exactly like the European *M. rotundata*; it may be known from *rotundata*, and also from all the closely allied Formosan species, by the dense white hair of the front having conspicuous black hairs intermixed. Another very similar species is the Australian *M. quinquelineata*, Ckll., but this has the hair on inner side of hind tarsi purplish black, whereas in *M. tranquilla* it is clear ferruginous. Other close allies are *M. seychellensis*, Cam., from the Seychelles Islands, and *M. palmarum*, Perkins, from the Hawaiian Islands.

Mandibles quadridentate; hair of head white, black on vertex, and mixed with black on front; clypeus very densely

punctured, but shining, not keeled, the lower margin finely crenulate or nodulose; supraclypeal area shining, sparsely punctured in middle; vertex, mesothorax, and scutellum closely and finely punctured; hair of thorax white, abundant, but black on disc of mesothorax, and much long black hair on scutellum; tegulæ dark brown. Wings slightly dusky. Legs with silvery hairs, those on inner side of tarsi orange-ferruginous; spurs ferruginous; hind basitarsi broad and flat. Abdomen black between the bands, with short black hair.

Hab. Formosa (*Sauter*). Two females in Berlin Museum. The type is from Taihanroku, June 11, 1908; the other from Takao, Oct. 1, 1907.

Megachile rixator, sp. n.

♀.—Length about 12 mm.

Black (including legs), but flagellum ferruginous beneath; form rather narrow and parallel-sided; pubescence pale ochreous, white ventrally, the ventral scopa white at base, otherwise light fulvous, strongly fulvous apically; general form and appearance (except for the yellowish pubescence) like the American *M. soledadensis*, Ckll.

Mandibles quadridentate; clypeus densely punctured, but with a broad shining median low ridge, not amounting to a keel; supraclypeal area with its lower part bare and shining, front covered with dense ochreous hair, with no black intermixed; hair of vertex rather dark reddish; vertex with fine punctures; mesothorax and scutellum finely and very densely punctured; thorax thickly clothed with ochreous hair, short and darker, but not fuscous, above, white beneath; tegulæ reddish with pallid margins. Wings slightly dusky. Legs with shining white and pale yellow hair, ferruginous on inner side of tarsi; hind basitarsus broad and flat; spurs very pale; claws with a basal tooth. First abdominal segment with much ochreous hair, the others with conspicuous narrow entire ochreous hair-bands; apical segment obliquely descending, its lateral profile making an angle of perhaps 45 degrees.

Hab. Takao, Formosa, Sept. 29, 1907 (*Sauter*). Two females in Berlin Museum.

A series of 19 other females collected by Sauter in Formosa were at first separated on superficial appearances, seeming smaller and more compact (length 9 to 10 mm), with cordate abdomen. These prove on examination to be *M. rixator*, varying in size, and with the abdomen retracted. They are all from Takao, collected in September and October.

Megachile abluta, sp. n.

♀.—Length 9½–10½ mm.

Size, colour, and appearance exactly as in *M. rixator*, but readily separable by the following characters: hair of last ventral segment black; hair of vertex fuscous; clypeus densely punctured, without any median smooth line; flagellum not red beneath; hair on inner side of tarsi very pale; ventral scopa usually paler, the basal half white; otherwise the two are essentially the same.

♂.—Length 7–9 mm.

Face densely covered with pale ochreous hair; flagellum black; anterior coxæ with short black spines; anterior tibiæ and tarsi simple, the tarsi red at apex; sixth abdominal segment bilobed, the lobes rounded, the dorsal surface with a large kidney-shaped dense patch of pale hair; no subapical ventral teeth.

This male looks just like the Australian *M. sequior*, Ckll., except that it lacks the thoracic hair-spots conspicuous in *sequior*. It is even more like the European *M. apicalis*, which is without the hair-spots, but *M. abluta* has a fairly evident pallid band in the scutello-mesothoracic suture, wanting in *apicalis*. In *apicalis* the margin of the sixth abdominal segment is denticulate, which is not at all the case in *abluta*. The kidney-shaped patch of hair is more extensive in *apicalis*, almost entirely covering the dorsal surface of the sixth segment.

Hab. Formosa (*Sauter*). 31 females and 34 males in Berlin Museum. The type is a female from Takao, Aug. 23, 1907. All the females come from Takao, July to October. The males bear the following data: Takao, May 3, and July to October; Taihanroku, June and July; Koroton, Sept. 8; Kagi, Aug. 29.

Megachile subusta, sp. n.

♂.—Length 11–12 mm.

In nearly all respects exactly like the male of *M. rufovittata*, but with the hair of the vertex and thoracic dorsum entirely ferruginous, without any fuscous or black. On the disc of the mesothorax the punctures are close, yet the shining surface is clearly visible between them, whereas in *rufovittata* this is not the case. The abdomen is much less closely punctured than in *rufovittata*: thus the disc of the fourth segment is closely punctured in *rufovittata*, sparsely

in *subusta*. The anterior and middle tarsi have long fringes of white hair behind.

Hab. Formosa (*Sauter*). Five males in Berlin Museum. The type is from Koroton, first half of September, 1907, Two are from Koroton, Sept. 8; two from Kagi, Aug. 20.

M. subusta and *rufovittata* are certainly distinct species, yet extremely closely allied.

Megachile aspernata, sp. n.

♂.—Length about 10 mm.

Black, with pale pubescence, which is white beneath and on legs, above ochreous-tinted; head broad, eyes pale greenish, moderately converging below; flagellum ferruginous beneath; front very densely and minutely granular-punctate, concave on each side; vertex finely irregularly punctured; mesothorax and scutellum very densely granular-punctate, like front; area of metathorax dull; tegulæ rather light brown, with pallid margins. Wings hyaline; second r.n. ending nearly as far from end of second s.m. as first from its base. Legs black; anterior coxæ with strong spines; anterior femora with inner surface pale ferruginous; their tibiæ a little reddish apically, and behind with a brush of white hair; their tarsi with the first joint bearing a hollow, boat-shaped scale or lobe, which is pale ferruginous; the anterior and middle tarsi are fringed with white hair behind, the middle ones not only have a large thick fringe, but the outer surface is densely covered with hair; the hind tarsi have a fringe of white hair in front. Abdomen rather short, finely and closely punctured, with coarse hair-bands; sixth segment with the projecting edge broadly rounded, emarginate in middle, and coarsely toothed; dorsal surface of sixth segment almost wholly covered with a dense mat of creamy-white hair; no subapical ventral teeth; margins of third and fourth ventral segments each with a little semicircular patch of glistening appressed pale yellow hair, quite distinct from the other pubescence.

Hab. Takao, Formosa, July 1, 1907 (*Sauter*). One male in Berlin Museum, the dorsal pubescence in poor condition.

Very distinct from all other Formosa species by the character of the anterior legs; the dentate margin of the sixth abdominal segment recalls the much larger and otherwise quite different *M. kagiana*. I cannot find any species very closely related to *M. aspernata*.

Megachile dinura, Ckll.

A female from Foochow, China (*H. R. Caldwell*), in the U.S. National Museum, cannot be separated from the Formosan *M. dinura.* It is in poor condition, having apparently been in alcohol.

Anthopora zonata (L.).

The Sauter collection from Formosa contains a long series of *A. zonata,* or what has passed everywhere as the Linnean species. The females include eleven from Takao, August to December, and ten without precise locality. The abdominal bands vary from bright blue to pale green, but I cannot distinguish more than one species. So far as the females go, there is no apparent difficulty in assigning them to *A. zonata,* and, according to current usage, the name var. *subcærulea* (Lep.) is applied to those with pale bands. An examination of the males reveals a curious state of affairs. The colour of the abdominal bands varies as in the females, but there are other good characters separating the specimens into three groups, as follows :—

(1) *A. zonata* proper, in the sense of Lepeletier and Dours. Face-markings creamy white; clypeus with only a narrow black band on each side ; hair of hind basitarsus entirely black ; fifth ventral segment black, with black hair, its apical margin broadly excavated or emarginate ; last ventral keeled. Thirty specimens ; Takao, August to October ; Taihanroku, June 11.

(2) *A. korotonensis,* nov. Face-markings light primrose-yellow ; bands at sides of clypeus rather broad, but essentially as in *zonata* ; outer side of hind basitarsus with much white hair ; fifth ventral segment very dark reddish, black-haired, with a tuft of white hair on each side (small white tufts also in *zonata*), the apical margin broadly excavated, but also depressed in middle. Koroton, Sept. 8, 1907. One specimen.

(3) *A. calceifera,* nov. Face-markings coloured as in *zonata,* but black marks at sides of clypeus large, notched below, having the form of a boot (in a single specimen the marks are narrower and band-like) ; hind basitarsi with a good deal of white hair on outer side ; fifth ventral segment coloured like

the others, except that there is a subapical, round, suffused, black spot, the hind margin in middle straight, neither excavated nor depressed; last segment with a round shining depression, in which is a strong carina. Twenty-three specimens. Takao, March, April, August, October; Koroton, Sept. 8, 1907.

Two other forms come from the Asiatic mainland :—

(4) *A. caldwelli*, nov. Face-markings pale yellow as in *korotonensis*, but marks at sides of clypeus large and notched below, shaped entirely as in *calceifera*; hind basitarsus with some white hair, especially at base; fifth ventral segment black, except for the tuft of white hair on each side, its margin broadly shallowly excavated; abdominal bands light blue. Foochow, China (*H. R. Caldwell*). U.S. National Museum. I have erroneously determined this as *A. zonata*.

(5) *A. subcærulea*, Lepeletier. Face-markings very pale yellow; clypeus with very large quadrate black patches as in the female; hind basitarsus without white hair; fifth ventral segment with hind margin straight. Kalutara, Ceylon, March 1910, 2 ♀, 1 ♂ (*E. Comber*); Nasik, India, Sept. 1908 (*E. Comber*). British Museum.

I suppose that this is Lepeletier's *subcærulea*, as he describes the sexes as having the face-markings alike. The female agrees well with the description, except that the antennæ are red beneath from the end of the third segment, and the fifth abdominal segment has black hair in the middle and white at the sides (instead of the two intermixed). The abdominal bands are pale blue, as in *caldwelli*.

From the standpoint of genetics the above insects are extremely interesting. The differences may be regarded as plus and minus variations, corresponding probably to Mendelian allelomorphic pairs, as follows :—

(1) Face-markings yellow (+) or white (−).
(2) Marks at sides of clypeus like female (+), or boot-like (first reduction stage) or narrow bands (second reduction stage).
(3) Hind basitarsus with hair all black (+) or partly white (−).
(4) Fifth ventral segment entire (+) or emarginate (−).

According to this scheme the several forms may be tabulated thus :—

	Face-markings. (Colour.)	Marks at side of clypeus.	Hind basitarsus.	Fifth ventral segment.
A. zonata	−	− (2)	+	−
A. korotonensis ..	+	− (2)	−	−
A. calceifera	−	− (1)	−	+
A. caldwelli	+	− (1)	−	−
A. subcærulea....	+	+	+	+

According to this plan, *A. subcærulea* seems to be the stem-form, while the others represent various degrees of reduction. *A. korotonensis* would seem to have been derived from the Chinese *caldwelli* ; while *zonata* and *calceifera* may represent independent derivatives from *subcærulea*. It is possible, however, that the forms inhabiting the same region (as *zonata* and *calceifera* in Formosa) may freely cross, with Mendelian results, in which case *calceifera* cannot be considered a valid species. Against this last supposition is the fact that the several characters seem to go together, with the single exception in regard to the clypeal marks mentioned under *calceifera*.

Still another form from North-west India may be described as follows :—

Anthophora comberi, sp. n.

Hair of head and thorax above pale reddish mixed with black, as in *zonata* ; abdominal bands very brilliant shining turquoise-blue ; face-markings light yellow : size of *zonata*.

♂ .—Lateral markings of clypeus reduced to small pyriform sutural spots (a third reduction stage) ; hind basitarsus with a few white hairs at extreme base ; fifth ventral segment *elevated* in middle and broadly emarginate (Nasik, = type).

♀ .—Clypeal marks large and elongate-quadrate, shaped as in *subcærulea*, and with the median yellow band broad ; spots at basal corners of labrum small ; hind basitarsi with the hair all black ; light hair of legs white, with a brown stain apically on middle tibiæ. Hab River, Karachi, Sept. 1909.

Hab. Nasik and Hab River (*E. Comber*). British Museum.

In the above scheme this will stand as +, − (3), +?, −. This is a considerably larger insect than *A. subcærulea*.

LVIII.—*A Contribution to our Knowledge of the Oligochæta of Travancore.* By Dr. Luigi Cognetti de Martiis, Torino, R. Museo Zoologico.

[Plate XIII.]

The present paper is the result of the examination of a collection belonging to the British Museum and entrusted to me by Prof. F. J. Bell, who received them from the Trivandrum Museum *.

The first work in which Oligochætes from Travancore are mentioned is a paper by Miss S. M. Fedarb published in 1897 (4). Prof. Dr. W. Michaelsen has recently discussed the drilofauna of the entire Indian Empire and adjacent regions in two valuable works (12, 13). From these works it results that nineteen species of earthworms have already been collected in the State of Travancore.

The collection examined by me contains only one of the species which are contained in Michaelsen's lists, viz. *Glyphidrilus annandalei*, Mich. It contains besides four new species and a "peregrine" species, *Lampito mauritii*, Kinb., which has already been collected in other localities of S. India.

At present our knowledge of the drilofauna of Travancore extends to twenty-four species, as follows:—

Fam. Moniligastridæ.

Drawida barwelli (*Bedd.*).
—— ghatensis, *Mich.*
—— pellucidus (*Bourne*), var. pallida, *Mich.*
—— travancorensis, *Mich.*
—— fakir, sp. n.
Moniligaster deshayesi, *E. Perr.*

Fam. Megascolecidæ.

Subfam. Megascolecinæ.

Plutellus timidus, sp. n.
Megascolides tenmalai, *Mich.*
Lampito mauritii, *Kinb.*
Megascolex insignis, *Mich.*
—— konkanensis, *Mich.*
—— travancorensis, f. typica, *Mich.*
var. ghatensis, *Mich.*
var. quilonensis, *Mich.*
—— ratus, sp. n.
—— eunephrus, sp. n.
Pheretima travancorensis (*Fedb.*).

Subfam. Octochætinæ.

Octochætus aitkeni (*Fedb.*).
—— pittnyi, *Mich.*

Subfam. Trigastrinæ.

Dicrogaster affinis (*Mich.*).
—— bolani (*Mich.*).
—— travancorensis (*Fedb.*).

Subfam. Ocnerodrilinæ.

Gordiodrilus travancorensis, *Mich.*
Ocnerodrilus occidentalis, *Eisen.*

Fam. Glossoscolecidæ.

Subfam. Glossoscolecinæ.

Pontoscolex corethrurus (*F. Müll.*)

Subfam. Microchætinæ.

Glyphidrilus annandalei, *Mich.*

* I have to express my sincere thanks to Prof. F. J. Bell for this new proof of consideration in sending me this very interesting collection.

This paper was already in type when I received, by the kindness of Prof. Dr. W. Michaelsen, his monograph "Die Oligochätenfauna der vorderindisch-ceylonischen Region" (13), issued in September, 1910. In the following pages is found a description of *Glyphidrilus annandalei*, Mich., which I wrote before receiving this monograph. My description agrees with that of Michaelsen; the two descriptions supplement each other.

Fam. Moniligastridæ.

Drawida fakir, sp. n. (Pl. XIII. figs. 1–3.)

A single immature specimen.

External characters.—Length 85 mm., greatest thickness 3 mm.; number of segments 98.

Colour uniformly lilac-grey.

Head prolobous; body cylindrical, slightly reduced in diameter at the tail.

Setæ strictly paired: $aa=bc$; *dd* a little larger than half the circumference of the body.

Dorsal pores not seen. Clitellum not developed. Nephridial pores from the third segment, on the anterior margin, in the lines of the superior dorsal setæ (*d*).

At the intersegmental furrow x.–xi., a little laterally to the lines of ventral bundles of setæ, is present a pair of small conical tubercles, contained in two small and not very deep pouches; these tubercles are in relation with the male pores, but I have not been able to determine whether the pores are at the summit or at the base of the tubercles (Pl. XIII. fig. 1). The tubercles correspond in shape with those drawn by Michaelsen (12, pl. xiii. fig. 2) for *Drawida sulcata*, Mich.

Female pores at anterior margin of the xii. segment, in the lines of the superior ventral setæ (*b*).

Spermathecal pores at intersegmental furrow vii.–viii., a little laterally to the lines of ventral bundles of setæ.

Internal anatomy.—Septa vi.–vii.—viii.–ix. somewhat thickened.

Four strong gizzards are distributed in segments xiii., xiv., xv., and xvi.

The paired hearts are found in segments vi.–ix. At x. segment, close behind the anterior septum, a pair of trunks originate from the dorsal vessel. These two trunks are directed backwards in the ventral region, to unite with the subneural blood-vessel close to the anterior surface of septum xi.–xii.

A large pair of testicular vesicles runs through septum ix.–x. laterally to the gut. The anteseptal part of each vesicle (a little more developed at the left side) is divided into two globular portions by a constriction. The postseptal part is more developed than the anteseptal, from which it is separated by a deep constriction. The postseptal part is irregularly pear-shaped, diminishing in diameter at the posterior end, and it is entirely contained in the x. segment (Pl. XIII. fig. 2). On the left side the postseptal part is longer than on the right, and at the end is rather S-shaped.

A sperm-duct-funnel is found in the postseptal portion of each vesicle, united to its ventral wall just behind septum ix.–x. The sperm-ducts are short and a little undulated; they enter into the proximal part of the prostates. The prostates are white and tubular; they are closely coiled on each side. They are of equal thickness throughout their length, and their distal extremity is provided with a short, thinner, muscular tract.

A pair of enormously developed ovaries lies in the xi. segment, suspended to the anterior septum along a line that almost entirely encloses the gut. The ovaries are enclosed in a very thin-walled pericœsophageal capsule that extends from septum x.–xi. to septum xi.–xii. At the posterior wall of the ovarial capsule (viz. septum xi.–xii.) are placed, on each side, the orifice of an egg-sac and the funnel of the oviduct. The first is surrounded by a circle and placed dorsally to the gut. The little oviducal funnels are ventral and connected with the short and straight oviducts.

The egg-sacs are cylindrical and prolonged backwards, but contained in the xii. segment, in which they are only once folded. The cavity of the egg-sacs is partially obliterated by a rich network of blood-vessels, but eggs are wanting.

Spermathecæ in viii. segment near to septum vii.–viii. Each spermatheca consists of a white, thin-walled, spherical ampulla and a thin, long, bent duct * which traverses the body-wall to open directly to the exterior. Muscular atrial chambers are wanting. The two ampullæ lie dorsally to the œsophagus, and the pole of each ampulla, which is opposite to the origin of the canal, is fastened to the middle line of the posterior surface of septum vii.–viii. by a very short and straight ligament (Pl. XIII. fig. 3).

Hab. Arumanallur, 45 km. E.S.E. from Trevandrum (*Mr. P. Shungara Narayana*, 23. vi. 1910).

This new species of *Drawida* is easily distinguished from

* See Michaelsen, (12) p. 139.

the other species of the same genus by the position of the male and spermathecal pores, number and position of the gizzards, and shape of prostates.

Fam. **Megascolecidæ.**

Subfam. *Megascolecinæ.*

Plutellus timidus, sp. n. (Pl. XIII. fig. 4.)

Five mature specimens are in the collection.

External characters.—Length 30–48 mm., thickness about 1 mm.; segments nearly constant in number, viz. 116–119.

Colour violaceous grey, at the clitellum brown violaceous.

Head epilobous, prostomium small. The body is a little compressed behind the clitellum, except the tail.

Setæ paired all along. The dorsal bundles are beyond the lateral lines. About at the x. segment $aa=\frac{5}{8}\ ab$, $ab=\frac{3}{4}\ bc$, $bc=cd$, cd somewhat smaller than dd, dd a little larger than $\frac{1}{2}$ of the whole circumference. The middle lateral distances increase in amplitude behind the clitellum, whilst the middle dorsal distance is gradually reduced. At the middle region of the body $aa=\frac{5}{8}\ ab$, $ab=\frac{1}{2}\ bc$, $cd=\frac{2}{3}\ bc$, $dd=cd$. At the tail $aa=ab=\frac{1}{2}\ bc$, $dd=cd=\frac{1}{2}\ bc$.

First dorsal pore at the intersegmental furrow xi.–xii. (?x.–xi.).

Nephridial pores, at least before the clitellum, nearly in the lines of the setæ *b*. Clitellum developed all round the body, and occupying segments xiv.–xvii. The intersegmental furrows xiv.–xv., xv.–xvi., and xvi.–xvii. are nearly obliterated.

Male pores on small papillæ on the xviii. segment, about equally distant from the two bundles of setæ. A second pair of papillæ on the xix. segment, close laterally to the ventral setæ *b*. These papillæ are prolonged forwards and obliquely, and they are connected on each side with the anterior papilla (Pl. XIII. fig. 4).

Female pores on the xiv. segment, a little forwards and internally to the first ventral setæ (*a*). These pores are situated in a small transverse-oval area, which is rather more distinct than the clitellum (Pl. XIII. fig. 4).

A pair of spermathecal pores on the viii. segment, in the zone of the setæ, between the lines of setæ *b* and *c*.

Internal anatomy.—First septum v.–vi. very thin; septa vii.–viii.—xii.–xiii. thickened. A not very strong gizzard in the v. segment. Intestine without typhlosole.

Nephridial system meganephric.

Testes and sperm-duct-funnels free in the x. and xi. segments. A pair of little grape-like sperm-sacs depends from septum xi.–xii. into the xii. segment.

A pair of tubular prostates lies in the xviii. segment, but a short proximal part of these organs stretches out into the xix. segment through septum xviii.–xix. The delicate axial tube of each prostate is not ramified. The sperm-ducts enter the proximal part of the muscular ducts of the prostates, which is a little coiled. There are no penial setæ.

A pair of ovaries and oviduct-funnels in the xiii. segment; a pair of small egg-sacs in xiv.

A pair of spermathecæ in the viii. segment. These organs consist only of a long pear-shaped ampulla. There are no diverticula.

Hab. Muvattupuzha, 170 km. N.N.E. from Trevandrum (*Mr. Shungara Narayana*, 28. iv. 1910).

This interesting new species is distinguished from others of the same genus by the possession of a single pair of spermathecæ. This character requires some slight modification of the definition of the genus *Plutellus* as given by Michaelsen *. Spermathecal pores on the viii. segment, in the zone of setæ, were already found by Michaelsen in his *Plutellus indicus* f. *typica* †, but that species possesses a second pair of spermathecal pores in intersegmental furrow viii.–ix.

Lampito mauritii, Kinb.

Megascolex mauritii, Michaelsen, (7) p. 227.
Lampito mauritii, Michaelsen, (11) p. 160; (12) pp. 108, 178, 179.

Some mature and several young specimens were collected.

Hab. Murukunpuzha, 15 km. N.W. from Trevandrum (*Mr. Shungara Narayana*, 5. v. 1910); Vazhote, 25 km. E.N.E. from Trevandrum (*ditto*, 27. vi. 1910); Shertalay, 150 km. N.N.W. from Trevandrum (*ditto*, 10. iv. 1910).

Megascolex eunephrus, sp. n. (Pl. XIII. figs. 5–7.)

A mature but incomplete specimen.

External characters.—Length 85 mm. (the tail is wanting), greatest thickness (before the clitellum) 3 mm.; number of segments 195.

Colour uniformly lilac-grey.

Head proepilobous. The segments are not biannulated.

* See (7) p. 163, and (10) p. 159.
† See (11) p. 148, and (12) pp. 154, 155.

Number of setæ nearly constant in each segment, about 24, both at the anterior and at the middle and posterior regions. The circles of setæ are regularly but not broadly interrupted ventrally ($aa=2\,ab$); dorsally the setæ are a little more distant.

Clitellum developed all round the body and occupying segments xiv.–xvii.

First dorsal pore on intersegmental furrow viii.–ix.

On intersegmental furrows (?ii.–iii.) iii.–iv.—viii.–ix. is found a pair of little nephridial pores, in the lines of setæ *e*.

In the middle ventral region of the xviii. segment there are a few large, but well-marked triangular papillæ, which enclose a little triangular area (Pl. XIII. fig. 5). One of the angles of the papilla is directed forwards and extended on the posterior margin of the xvii. segment. Other angles are lateral, and near them are found the male pores, in the lines of setæ *b*.

Spermathecal pores two pairs, on intersegmental furrows vii.–viii. and viii.–ix., in the lines of setæ *b*.

Internal anatomy. — Septa vi.–vii.—ix.–x. moderately thickened.

A gizzard in the v. segment. The œsophagus is irregularly swollen in segments xv.–xx., but is not provided with calciferous glands. The wide intestine suddenly begins in the xxi. segment. Last hearts in the xiii. segment.

On segments iii.–ix. is found respectively a pair of large nephridia. These organs consist of a proximal portion, from which originates a thin-walled ribbon-like duct, which increases in length from the first to the seventh pair of nephridia and passes through the body-wall at the extreme anterior margin of each segment. The proximal portion of these meganephridia is conspicuous, and consists of a tuft of very thin whitish filaments, each of which contains a long strip of nephridial tubule.

From the x. segment the nephridia are diffused and very small, but on the xiv. and xv. segments, on each side of the œsophagus, is found a pair of meganephridia (besides the small micronephridia) which are similar to those of segments iii.–ix.

Testes and sperm-duct-funnels free in the x. and xi. segments. Two pairs of grape-like sperm-sacs lie in segments xi. and xii., depending from the anterior septum.

The glandular part of the prostates is much lobed and extended into segments xvii.–xx. The muscular duct of each prostate lies in the xviii. segment, in which it describes a curve towards the middle ventral line, from the anterior

septum to the male pore, which is placed just behind the circle of setæ (Pl. XIII. fig. 6). Penial setæ are wanting.

There are two pairs of spermathecæ in segments viii. and ix. The main pouch is club-shaped; the diverticulum is finger-shaped and opens into the distal part of the duct of the main pouch. The length of the diverticulum is nearly equal to a third of the main pouch (Pl. XIII. fig. 7).

Hab. Coorloon (*Mr. Shungara Narayana*, 23. vi. 1910).

An important character of this new species of *Megascolex* is the presence of large paired meganephridia in the anterior segments. Similar nephridia have been found by Prof. Benham in *Megascolex laingii*, Benh.*, but perhaps in the cephalic region only, where they "probably" perform the office of peptonephridia.

Megascolex ratus, sp. n. (Pl. XIII. figs. 8–10.)

Four mature specimens in the collection, but only three of these are complete.

External characters.—Length: A 230, B 260, C 315 mm.; greatest thickness, on x. segment: A 7, B 9, C 10 mm. Number of segments: A 162, B 168, C 218.

Colour dorsally violet-brown or dark violet, ventrally grey; grey lines are present corresponding to the circles of setæ.

Head tanylobous. The prostomium is short, broad, and provided dorsally with longitudinal furrows, prolonged on to the first segment; this segment is provided with several longitudinal furrows, which do not reach the posterior margin. Segments x.–xiii. are biannulated.

Setæ more crowded in the ventral than in the dorsal region, particularly towards the clitellum, where the circles of setæ are interrupted in the middle ventral line ($aa=2\ ab$, $ab=bc=cd\ldots$), but the interstice is wanting at the dorsal region ($zz=yz=xy\ldots$). Somewhat behind the clitellum the circles of setæ are provided with two middle interstices ($aa=3$ or $4\ ab$, $zz=3$ or $4\ yz$).

There is no great difference in the dimensions of the setæ of a circle. At the x. segment there are about 180 setæ, and in the middle region of the body about 135 setæ on each segment.

Clitellum saddle-shaped, occupying segments xiv.–xviii., unprovided with intersegmental furrows. On the xiv. and xv. segments it is a little more extended than on the following segments (Pl. XIII. fig. 8).

* See (1) pp. 273, 274. "The worm is micronephridic, anteriorly is a large glandular body, which is probably a peptonephridium." As regards the term "peptonephridium," consult my note of 1905 (2).

On the clitellum the setæ are wanting. Male pores on the xviii. segment corresponding to the lines of setæ *h* ; between the male pores the setæ are wanting. Each male pore is placed on a whitish tubercle, which is supported by a swollen papilla (Pl. XIII. fig. 8).

There are other paired papillæ on intersegmental furrows xvi.–xvii., xix.–xx., xx.–xxi., and xxi.–xxii., crowded in the middle ventral line. The last or the last two pairs of papillæ may be wanting ; the pair of intersegmental furrows xvi.–xvii. is more developed and swollen than other pairs (Pl. XIII. fig. 8). Female pores in the anterior part of the xiv. segment, about in the lines of the setæ *a*, in a transversely extended little area, placed towards the circle of the setæ.

Spermathecal pores two pairs, hidden in intersegmental furrows vii.–viii. and viii.–ix. in the lines of the setæ *f*.

Internal anatomy.—Septa vii.–viii. — xii.–xiii. much thickened.

A strong gizzard in the vi. segment. The sacculated intestine begins in the xiv. segment. Last hearts in the xiii. segment.

Micronephridia very small.

Two pairs of testes and sperm-duct-funnels lie ventrally in the x. and xi. segments. The testes and funnels of a single segment are included in a pair of large and a few lobated capsules, which join dorsally to the œsophagus. These capsules are compressed between the strong funnel-like septa ix.–x., x.–xi., and xi.–xii., to which they are united only in the ventral region of the body ; in other regions they are free. It is to be noted that the capsules round the œsophagus are traversed by little muscular bundles, which go from one septum to another, and sometimes are prolonged to the body-wall.

A pair of white, finger-shaped sperm-sacs depends from septum ix.–x. into the ix. segment ; a second pair of similar sacs depends from septum xi.–xii. into the xii. segment. The sperm-sacs are somewhat smaller than the testicular capsules.

The prostates consist of a strong, cylindrical, muscular duct ; that from the male pore goes laterally, and then backwards into the xix. segment, to unite with the glandular portion. This portion is well developed and provided with grooves which form lobes at the margins. The glandular portion extends from the xix. to the xxii. segment inclusive (Pl. XIII. fig. 9).

There are two pairs of spermathecæ in the viii. and ix. segments. The main pouch consists of a sac-shaped trans-

versely striped ampulla, which is somewhat broader distally than at the rounded proximal end, and of an abruptly separated duct, about a third as long and as broad as the ampulla. Into the proximal end of this duct opens a small diverticulum, which contains some (4–5) oval seminal chambers. The diverticulum is enclosed in the duct-wall, but projects above its surface (Pl. XIII. fig. 10).

Hab. Coorloon (*Mr. Shungara Narayana*, 23. vi. 1910).

The diverticulum of the spermathecæ enclosed in the duct-wall is an important feature of this new species, which also appears in *Megascolex cæruleus*, R. Templ. *, and *M. hendersoni*, Mich. †, but *M. ratus* is distinguished from these two species by well-defined characters, viz., papillæ, number and shape of the sperm-sacs, &c.

Fam. **Glossoscolecidæ.**

Subfam. *Microchætinæ.*

Glyphidrilus annandalei, Mich. (Pl. XIII. figs. 11 & 12.)

Glyphidrilus annandalei, Michaelsen, (13) p. 101.

Nine mature or nearly mature specimens, six of them complete and three incomplete young specimens.

External characters.—The longest, but not fully mature, specimen measures 165 mm. in length, and 2·5–3 mm. in greatest (at the x. segment and clitellum ‡) or 1 mm. in smallest thickness (at the posterior end). This specimen is composed of 205 segments, but the tail is wanting. Other mature or nearly mature specimens: length 90–128 mm., greatest thickness 3·5–4 mm., smallest thickness 1–1·5 mm.; number of segments 125 (for a length of 90 mm.) to 322 (for a length of 128 mm.).

The shape of the body is very similar to that of *Criodrilus* and *Alma*. The anterior region is conical and provided at the end with a broad and short prostomium.

In some specimens there is a small transverse furrow on the dorsal surface of the prostomium, which determines the head prolobous.

Segments i.–iii. are short, iv.–xii. are the longest of all, and appear more or less distinctly triannulated.

In the mature specimens the body is somewhat depressed between the xxv. and xxxv. segments, and this depression extends often to all the clitellar region.

* See Michaelsen, (7) p. 232, ubi liter.

† See Michaelsen, (11) p. 162, and (12) p. 184, pl. xiii. fig. 23.

‡ The fin-like lateral plates are not included.

The posterior third of the body is coiled and distinctly tetragonous ; the transverse section of the tail is trapezoid, the largest side corresponding to the dorsal surface of the body, and the four angles to the bundles of the setæ.

The tail is smaller than the cephalic region. The anal pore appears as a short longitudinal cleft in the middle dorsal line of the last three segments.

Colour violet-grey, clearer and with a tendency to rose-colour at the clitellum, especially on segments . . . . xvii.–xxxiii. . . . .

The body-wall is very thin, especially at the tail, and internal organs can be seen through them : for example, the spermathecæ on intersegmental furrows xiii.–xiv. to xvi.–xvii. in mature specimens.

The setæ are paired, but not strictly. On x. segment *aa* nearly = 2 *ab*, *ab* = ½ *bc*, *cd* = *ab*, *dd* a little larger than 2 *cd* or than *aa*. On the posterior half of the body the setæ are more strictly paired : *aa* nearly = 3 *ab*, *aa* = *bc*, *ab* = *cd*, *dd* nearly = 4 *cd*.

All mature specimens are provided with unpaired middle ventral papillæ on segments (xii.) xiii. to the xviii. . . . . xxiii. (xxv.). In one specimen there are also small median papillæ on segments xxxiii.–xxxv.

Paired lateral papillæ are found close laterally to the setæ *b* of segments xviii.–xxvi. and xxxiv.–xxxv. Some specimens are also provided with scattered paired papillæ on segments xvi., xvii., and xxvii.–xxxiii., or on some of these (Pl. XIII. fig. 11).

All the papillæ are slightly swollen, more so near the posterior than the anterior margin of their respective segments. Each papilla has the appearance of a little grey round stain, which is provided in its centre with a small whitish circle (Pl. XIII. fig. 12).

The clitellum is developed all round the body, and occupies at most twenty-five segments. Indeed, in a specimen from Achencoil River banks it extends from the xv. to the xxxix. segment, and is more or less evident from its rose-grey colour, and for the slight tumefaction, which is in relation to a greater quantity of glandular cells in the epidermis.

In other specimens the posterior margin of the clitellum is between the xxxv. and xl. segments, while its anterior margin seems to be constantly on intersegmental furrow xvii.–xviii. All the intersegmental furrows of the clitellum are recognizable, but not very distinctly those included between the xxv. and xxxiv. segments (Pl. XIII. fig. 11).

The clitellar region may be depressed, at least partially, and its lateral margins, often rather sharp, are provided with

two small longitudinal stripes, which are interrupted at the intersegmental furrows. The stripes extend on segments xviii. to xxvi. ($\frac{1}{2}$ xxvii.) and on segments ($\frac{1}{2}$ xxxii., xxxiii.) 1/*n* xxxiii. and xxxiv. They are placed laterally to the lines of setæ *b* ; between these lines and stripes are found the paired lateral papillæ. Close ventrally to the stripes, for their whole length, are two thin grey bands, which are interrupted, as are the stripes, on the space between segments xxvi. and xxxiii. or xxxiv. (Pl. XIII. fig. 12).

In this space the body-depression is greatest, and the lateral margins are quite sharp and expanded to form two fin-like plates, a little undulated, which extend to segments xxvii.–xxxii. or $\frac{1}{2}$ xxxiii. (or xxxiii.), being in the lines of the stripes described above (Pl. XIII. fig. 11). Each plate is about 1 mm. wide, their margins are parallel, and their ends diminish rapidly in breadth.

The two stripes, with the adjacent grey bands, are similar to the tubercula pubertatis of some Lumbricidæ—for example, of *Octolasium complanatum* (Ant. Dug.) *,—and the fin-like plates correspond to the organs which in other species of *Glyphidrilus* have been named by Rosa † "tubercula pubertatis," by Horst ‡ "clitellar ridges," and by Michaelsen § "Pubertätstuberkel-Wälle," "clitelliale Längswülste," "Pubertätssäume."

It seems to me that these fin-like plates may be regarded as corresponding to those curious appendages which have been described in the Criodriline genera *Alma* and *Criodrilus* under the name of "penes." They are provided, among other things, with a rich vascularization ‖ like the last-named organs. The whole shape is altogether different.

The nephridial pores are in the lines of setæ *b*.

I found the male pores only in two specimens. They appear as two point-like depressions on intersegmental furrow xxix.–xxx. in the lines of setæ *b*.

The female pores are not visible.

The small spermathecal pores are distributed in various numbers—to six pairs—on intersegmental furrows xiii.–xiv. to xvi–xvii. On each side they are contained between the

* See the figure of the clitellar region of this species given by Rosa, (14) pl. i. fig. 4.

† See Rosa, (15) p. 387, pl. xii. fig. 1.

‡ See Horst, (5) pp. 38, 76, and pl. ii. fig. 18.

§ See Michaelsen, (6) pp. 196, 197, 242, and pl. xiii. fig. 1 *cw.*; (7) pp. 459–461 ; (8) p. 36 ; (13) p. 102.

‖ See Horst, (5) p. 39. The structure and development of the "penes" of the Criodrilinæ are the subject of a recent paper by me (3).

first and last lines of setæ, rarely more ventrally, and they are, nearly always, quite in the lines of the setæ.

Internal anatomy.—The septa 6–7 to 11–12 are slightly thickened.

A moderately developed oblong gizzard occupies the entire length of the viii. segment and a little part of the vii. The intestine begins in the xiv. segment. There are three pairs of hearts in segments ix., x., and xi.

Two pairs of testes and sperm-duct-funnels lie free in segments x. and xi. The sperm-sacs are paired and placed in segments ix., x., xi., and xii. Those of the first three pairs are nearly equal in size, but those of the last pair are somewhat larger, and push backwards the two thin septa xii.–xiii. and xiii.–xiv.

No prostates are recognizable with the dissection lens.

The ovaries depend in the xiii. segment from the ventral margin of septum xii.–xiii.

The spermathecæ are quite intersegmental in position, and they appear as white little spherical bodies, which are visible through the thin body-wall. They are not provided with a distinct duct. Their number may reach to six pairs on each of the intersegmental furrows xiii.–xiv., xiv.–xv., xv.–xvi., and xvi.–xvii.

Hab. Achencoil River banks (*Mr. Shungara Narayana*, 3. v. 1910), Arumanallur, 45 km. E.S.E. from Trevandrum (*idem*, 23. vi. 1910), ? Azhagiapandipuram, 55 km. E.S.E. from Trevandrum (young specimens, *idem*, 20. vii. 1910).

A specimen from the second locality shows its external and internal organs transferred three segments forwards. Its male pores are on intersegmental furrow xxvi.–xxvii., a little laterally to the lines of setæ *b*. The anterior end is regularly shaped and shows no signs of regeneration.

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EXPLANATION OF PLATE XIII.

List of the Abbreviations.

cl.=clitellum, *n.c.*=neural chord, *œ.*=œsophagus, *p.*=fin-like plate, *s.*=septum.

Drawida fakir, sp. n.

Fig. 1. Ventral view of x. and xi. segments, with the male tubercles at the intersegmental furrow. × 6.
Fig. 2. Testicular vesicle of the right side, seen laterally. × 6.
Fig. 3. Hinder surface of septum vii.–viii., with a transverse section of the œsophagus and the two spherical spermathecæ, provided with coiled duct. × 6.

Plutellus timidus, sp. n.

Fig. 4. Ventral view of the clitellum and adjacent region (semidiagrammatic). × 6.

Megascolex eunephrus, sp. n.

Fig. 5. Ventral view of the xviii. and adjacent segments (semidiagrammatic). × 6.
Fig. 6. The right prostate. × 6.
Fig. 7. A spermatheca. × 6.

Megascolex ratus, sp. n.

Fig. 8. Ventral view of the clitellar and adjacent regions (semidiagrammatic). × 6.
Fig. 9. The right prostate. × $2\frac{1}{2}$.
Fig. 10. A spermatheca. × 6.

Glyphidrilus achencoili, sp. n.

Fig. 11. Ventral view of the anterior and clitellar regions (diagrammatic). The greatest number of papillæ are figured. × 2.
Fig. 12. Ventral view of three segments of the clitellar region before the fin-like plates. × 6.

LIX.—*Description of a new Species of the Genus* Polytoreutus. By Dr. Luigi Cognetti de Martiis, R. Museo Zoologico, Torino.

Prof. F. J. Bell, of the British Museum, has recently sent me an East-African earthworm which I have been able to recognize as the type of a new species. I wish to express my thanks to him for his kindness in sending me many earthworms which from time to time have come into his hands for identification.

Polytoreutus baralypton *.

External characters.—Length 225 mm., thickness 4–5 mm.; number of segments 310.

Colour white yellowish.

Ventral setæ much wider apart than the external setæ. At the x. segment $aa=2\frac{1}{2}\ ab$, $ab=\frac{1}{2}\ bc$, *ad* equal to half of the whole circumference. At the middle region of the body $aa=2\ ab=bc$, *ad* always $=\frac{1}{2}$ circumference. Nephridial pores in the lines of the lateral bundles of setæ.

Clitellum developed all round the body and occupying segments xiii. to xviii.

A single male pore on intersegmental furrow xvii.–xviii., in the middle ventral line; a small depressed oval area surrounds this pore.

Female pores are not recognizable. They lie in the intersegmental furrow xiv.–xv., and are, ventrally, near to the lines of nephridial pores.

A single spermathecal pore behind the male pore upon intersegmental furrow xviii.–xix. It is surrounded by a whitish ring.

Internal anatomy.—Septa v.–vi. to xi.–xii. a little thickened.

A strong gizzard lies in the v. segment.

Unpaired œsophageal glands or ventral pouches ("Chylustaschen") in segments ix., x., and xi.; a pair of calciferous glands in the xiii. segment, developed around the œsophagus, but interrupted in the dorsal and ventral middle lines.

Dorsal vessel single; large hearts in the x. and xi. segments.

A pair of testes (? free) depends in the xi. segment from

* Philosophical term.

septum x.–xi. Opposite to them are found the spindle-shaped dilated chambers ("Samenmagazine") at the beginning of the sperm-ducts.

A pair of sperm-sacs depends from the posterior surface of septum xi.–xii.

These organs extend slightly into the xii. segment, where their surface appears a little furrowed; the expanded portion is provided posteriorly with a tubular appendix. The tubular appendix of the sperm-sac of the left side is

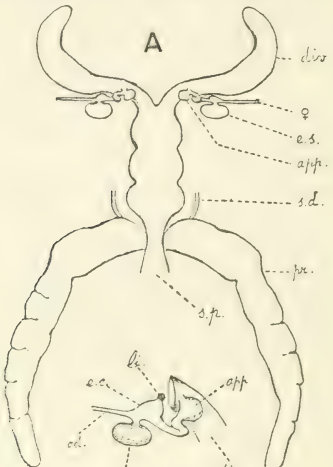

Fig. A.—Female generative organs and prostates of *Polytoreutus baralypton*, sp. n. × 4.

Fig. B.—The central female generative organs of the left side, more magnified. × 6.

app.=globular appendix; *div.*=diverticulum of the spermatheca; *e.c.*=egg-capsule; *e.s.*=egg-sac; *li.*=ligament; *o.d.*=oviduct; *pr.*=prostate; *s.d.*=sperm-duct; *s.p.*=spermathecal pore; ♀=female pore.

short and closed in the xii. segment, but that of the right side is longer and reaches the xviii. segment, being ribbon-like and a little dilated at the extremity. This inequality in the length of the sperm-sacs has also been found by Beddard *

* See Proc. Zool. Soc. 1907, pp. 417 *et seq.*

in *Polytoreutus ruwenzorii*, Bed l., and *P. granti*, Bedd.; but in these two species the right sperm-sac is longer than the left.

The sperm-ducts run backwards against the ventral body-wall till they reach the prostates near to the male pore (fig. A, *s.d.*, *pr.*). The prostates are oblong and irregularly moniliform, and they appear of a yellowish colour. They extend from intersegmental furrow xvii.–xviii. to the xxvi. segment, and pass from the ventral to the dorsal region of the body. A distal muscular duct is not distinguishable; a strong bursa propulsoria in relation with the male pore is wanting (fig. A, *pr.*).

A pair of nearly globose shortly stalked egg-sacs depends in the ventral region from the posterior surface of the very thin septum xiii.–xiv. (figs. A and B, *e.s.*). The stalk of each egg-sac extends laterally into the rectilinear oviduct (*o.d.*), and in the opposite direction it passes into a duct, which is a prolongation of the oviduct itself, and which opens out into one of the anterior diverticula of the spermatheca (*div.*) after it has described a short spiral line. This duct is provided, at the extremity which opens into the spermathecal diverticulum, with a little globular lateral appendix (*app.*). A small egg-capsule, or "Ovarialblase," is present at the distal extremity of this duct, where the egg-sac opens into it (*e.c.*). This egg-capsule is fastened in the xiii. segment by a short ligament (*li.*).

The spermatheca is anteriorly bicornuous, *i. e.* it is divided into two oblong diverticula, which lie in the xiii. segment, and extends dorsally around the œsophagus and calciferous glands (fig. A, *div.*).

The unpaired ventral median spermathecal sac underlies the nerve-cord, and is compressed against the body-wall. In the two most anterior thirds it appears more dilated than near the spermathecal pore. Corresponding to septa xv.–xvi. and xvi.–xvii., which are traversed, it shows two constrictions, which form three pairs of rudimentary lateral diverticula that lie in segments xv., xvi., and xvii. In the xviii. segment the distal portion of the spermatheca is thin-walled and reaches direct to the external pore (*s.p.*). There is no muscular chamber to this pore.

Hab. ? Nairobi, British East Africa.

Polytoreutus baralypton is well distinguished from other species of the genus by several important characters, viz.: the absence of muscular chambers to the male and spermathecal pores, the number and arrangement of the spermathecal diverticula, &c.

LX.—*A new Amphipod Species*, Tryphosites alleni. By E. W. Sexton, Marine Biological Laboratory, Plymouth.

[Plate XIV.]

Two specimens of the species described below were taken by Dr. Allen during the cruise of the 'Huxley' in the north of the Bay of Biscay, August 1906, trawled in 246 fathoms, 48° 7′ N., 8° 13′ W.

Fam. **Lysianassidæ.**

Genus Tryphosites, G. O. Sars.

Tryphosites alleni, sp. n. (Pl. XIV.)

Two specimens, ovigerous females, measuring 10 mm. from the tip of the rostrum to the tip of the telson.

Besides these two specimens I have been able, through Mr. Tattersall's kindness, to examine some fourteen others, taken, together with the type species, *T. longipes*, by the 'Helga' on the west of Ireland, in 200 fathoms. They were of all sizes, measuring from 2·5 mm. to 10 mm. in length; the four largest were males.

With regard to the distribution of the two species, Mr. Tattersall has informed me that "*T. longipes* is alone found in shallow water. The other form is alone found in very deep water, and the two forms together in intermediate depths."

Description.

In general aspect much resembling the type species, *T. longipes**, the principal distinguishing characters being found in the hand of gnathopod 2, the shape of side-plate 4, the epimera of pleon-segment 3, and the telson.

Head longer than the first peræon-segment, but not equal to the first two in length; lateral corners much produced and acute.

Eyes large, a long oval, pigment faded.

Side-plates as in the type species with the exception of side-plate 4; in this (fig. 1) the projecting portion of the lower hind margin is rounded, in *longipes* it is truncate and angular.

* A full description and figures will be found in Prof. Sars's 'Crustacea of Norway,' vol. i. p. 81, pl. xxviii. fig. 3, and pl. xxix. fig. 1.

Pleon-segments 1 and 2, hind margins straight, postero-lateral angles obtuse. Pleon-segment 3 is the most easily observed distinguishing character of the species; in *longipes* the posterior lobe is acutely upturned, rounding gradually below into the inferior margin, while in *allenі*, in all stages of growth, the lobe is acutely produced below as well as above, the margin between the points being deeply concave (fig. 2).

Antennæ.—Superior antenna: peduncle as in *longipes*; flagella longer in proportion; *primary flagellum* in the large female considerably more than twice the length of the peduncle, 18-jointed; *accessory flagellum* nearly one-third the length of the primary, 6-jointed. The largest male in Mr. Tattersall's collection had 22 joints in the primary, 6 in the accessory.

Inferior antenna shorter than the superior in the female; flagellum 15-jointed. In the male the flagellum is filiform, 62 joints in the largest specimen, 46 in the smallest.

Oral parts.—*Lower lip* much as figured by Sars for *longipes*, densely covered with fine hairs, as is also the upper lip.

Mandibles (figs. 3 and 4) much as in the type species, but distinguished from it by the different proportions of the joints of the palp. *Cutting-plates* large, rounded, with a small recurved tooth above. The left mandible (fig. 3) has a very small *accessory plate*, the margin of which is divided into three rounded teeth. *Spine-row* with three spines. *Molar* large, prominent; crown reniform in shape, transversely ridged. The *palp* is very long and slender, the second joint longer in proportion than in *longipes*, twice the length of the third, with a row of graduated setiform spines crossing its distal end diagonally; third joint narrow, tapering to the tip, with a row of serrate spines on the inner margin, and an apical cluster of four longer ones setting out at a different angle.

Maxilla 1 (fig. 5).—*Inner plate* tipped with 2 plumose setæ; *outer plate* large, apex obliquely truncate, with 11 strong, flat, dentate spines, 10 of which are arranged close together in two rows, the remaining one being inset lower down on the inner margin. *Palp* large and broad; apical margin rounded and beset with 7 small stout teeth and 1 short spine.

Maxilla 2 as in *longipes*.

Maxillipeds (fig. 6).—*Inner plate*: apex truncate, with 3 short stout teeth; a row of plumose setæ starting from the outer angle runs halfway down the inner margin. *Outer plate* very large, furnished with 2 stout teeth apically and a

row of 13 minute ones along the inner margin ; 6 small spines are inset submarginally on the outer surface. *Palp* short, hardly longer than the outer plate ; terminal joint with a distinct nail and 3 setules subapically ; the second and third joints setose on the inner margins.

Gnathopod 1 much as in *longipes* ; second joint slightly longer in proportion ; sixth joint, palm oblique, with two sensory spines at the angle ; palmar margin convex and serrulate ; finger a little longer than the palm, furnished with a decurrent tooth near the apex, 3 setules inset in the notch and 1 behind it.

Gnathopod 2 (figs. 7 and 8) much more slender than in *longipes*. The second joint is longer in proportion. The sixth joint differs from that of the type species. In *longipes* it is described by Sars as being a little shorter than the fifth, oblong-oval, with the "superior edge straight, inferior one bulging out at the middle" ; the distal end is truncate, the finger being inset in the middle of the margin ; the palm straight, rounding into the hind margin. In *alleni* the sixth joint is considerably shorter than the fifth ; it is long and narrow, inferior margin straight, not bulging, front margin straight, curving a little distally to the insertion of the finger. The palm is convex and produced at the palmar angle ; the finger smaller than in *longipes*, of the same construction, but with the base more swollen ; tip curved, acute, with a decurrent tooth and a cluster of stiff bristles subapically. The bristles on the outer side of the hand are more striking than in *longipes* ; the bases are more swollen, being twice the width of the shafts, and the apical flagella are much longer and thinner (see fig. 8).

Peræopods much as in *longipes* ; first and second alike, slender, densely setose on the hind margins of the fourth, fifth, and sixth joints ; finger long, nearly three-quarters the length of the sixth joint. The hinder peræopods rapidly increase in length ; basal joints closely set with small spines anteriorly, posterior margin serrated ; the other joints very slender, spinose, fingers equalling those of the anterior peræopods in length, but only half their width.

Pleopods.—Rami long, with about 17 joints in the inner, and 19 in the outer ramus ; 5 cleft spines ; coupling spines small, the lower one with 3 recurved teeth, the upper and smaller one with 4.

Uropods more slender and more spinose than in the type species. *Uropod* 1 : peduncle very long and slender, with a row of 20 short spines on the outer curve, 8 longer ones on the inner side ; rami only two-thirds as long as the peduncle,

subequal to each other in length, very slender, with short spines on the outer curve and longer ones on the inner. *Uropod* 2 (fig. 9) : peduncle much shorter and nearly twice as stout as that of uropod 1 ; rami subequal to it in length ; the inner ramus, of the form characteristic of the genus, is much longer and narrower than in *longipes* ; it is actually of the same length as the outer ramus, but appears shorter through being inset at a different level. *Uropod* 3 (fig. 10) : peduncle broad, shorter than the rami ; inner ramus slightly the shorter, margin serrated, furnished with sensory spines and 1 plumose seta proximally ; outer ramus 2-jointed, outer margin with spines, inner margin serrate, with 3 long plumose setæ ; a setule in each apex.

Telson (fig. 11).—The sixth pleon-segment is produced in an acute process on either side of the telson ; in *longipes* these processes are shorter and rounded.

It tapers distally ; cleft to nearly three-quarters the length ; apices serrate on the inner side, each with 1 strong spine inset ; a pair of mobile ciliated hairs on either side of the cleft. There were 6 spines on one side in the largest female examined, 4 on the other (probably two have been broken off), but the number is less in the smaller specimens.

EXPLANATION OF PLATE XIV.

Fig. 1. Side-plate 4, × 17.
Fig. 2. Epimeron of the third pleon-segment, × 17.
Fig. 3. Left mandible, × 58.
Fig. 4. Right mandible, × 58.
Fig. 5. Maxilla 1, × 58.
Fig. 6. Maxillipeds, × 58.
Fig. 7. Gnathopod 2, × 42.
Fig. 8. Finger and one of the spines, gnathopod 2, × 265.
Fig. 9. Uropod 2, × 42.
Fig. 10. Uropod 3, × 42.
Fig. 11. Telson, × 42.

LXI.—*New Mammals from Tropical South America.*

By Oldfield Thomas.

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Rhodotes tumidirostris continentis, subsp. n.

♂. 77 ; ♀. 50, 78, 124.

Quite like the type form, as described by Miller * from the Island of Curaçao, but markedly larger.

* P. Biol. Soc. Wash. xiii. p. 160 (1900).

Dimensions of the type (the starred measurements taken in flesh) :—

Forearm 38·7 mm. (other specimens: ♀, 38·5, 38·8, 39).

Head and body *43; tail *48; ear *14; third finger, metacarpus 35·7, first phalanx 14·8; lower leg and foot (c. u.) 26.

Skull: greatest length 16·8; condylo-basal length 15·6; breadth across muzzle 5·4; breadth of brain-case 8·4; front of canine to back of m^3 7·1.

Hab. San Esteban, Carabobo, N. Venezuela.

Type. Adult male. Original number 77. Collected 24th December, 1910.

The four specimens are so uniformly larger than Miller's type (forearm of ♂ 36 mm., of ♀ 35), that it is evident that the form inhabiting the Island of Curaçao is a small insular race of its representative on the continent of South America.

In studying this most interesting bat I am able to confirm Miller's statement as to the imperfection of the posterior palate, which is as he describes in all the specimens, one of which I examined myself under a microscope before the soft palate was disturbed.

The palate-ridges are nine in number, the anterior ones simple and transverse, the posterior divided mesially and directed backwards in the centre, the whole series passing gradually from the one condition to the other.

Marmosa grenadæ, sp. n.

Allied to *M. murina*, but with 7—1—7 mammæ.

General characters of the red members of the genus, but the back is less rufous and more greyish than in most of them. Central dorsal area approaching "broccoli-brown," the sides becoming nearer "clay-colour," but the specimen has been skinned out of spirit, so that the colours are probably altered to some extent. Under surface creamy white, the hairs white to their roots except in a narrow area on each side of the belly, bordering the darker colour of the flanks. Tail pale grey, not becoming white terminally. Mammæ 7—1—7 = 15, the South-American *M. murina* having 4—1—4 = 9 or 5—1—5 = 11.

Skull shaped as in the Trinidad *Marmosa*, broader than in that of Tobago; supraorbital ridges thickened, projecting slightly over the orbits, but not forming angular postorbital processes.

Dimensions of the type (measured as a spirit-specimen) :—
Head and body 128 mm.; tail 174; hind foot 21·5; ear 25·5.
Skull: greatest length 39·5; condylo-basal length 38; zygomatic breadth 22; nasals 18 × 5·2; interorbital breadth 6·5; palatal length 22; three anterior molariform teeth 6·2.

Hab. Island of Grenada, West Indies. Type from Annandale.

Type. Adult female. B.M. no. 87. 6. 30. 5. Collected during the Grenada Eclipse Expedition of 1886, and presented by G. R. M. Murray, Esq. Three specimens examined.

Marmosa tobagi, sp. n.

Size about as in *M. grenadæ*, but skull more slenderly built. General colour nearly as in the Trinidad *Marmosa*, dark cinnamon, becoming more russet posteriorly, above; below creamy or buffy white, the hairs of the ventral region nearly all slaty at base. Mammary formula not known.

Skull narrower and with more slender muzzle than that of *M. grenadæ*.

Dimensions of the type (measured in the flesh) :—
Head and body 137 mm.; tail 196; hind foot 22.
Skull: condylo-basal length 37·5; zygomatic breadth 20; nasals 16·2 × 5·6; interorbital breadth 7; palatal length 21; three anterior molariform teeth 6·1.

Hab. Island of Tobago, West Indies.

Type. Adult male. B.M. no. 97. 6. 7. 53. Collected 11th March, 1897, and presented by Dr. Percy Rendall.

Marmosa nesœa, sp. n.

Size comparatively large, form stouter than in either the adjacent mainland or Tobago animals. General colour above between cinnamon and tawny, tending more towards ochraceous on cheeks and flanks. Under surface cream-buff, the hairs on the abdomen slaty at base, those on throat, centre of chest, and inguinal region buffy to their roots.

Skull larger and heavier than in the allied forms, the zygomata widely expanded. Supraorbital ridges thick and heavy, but rarely angularly projected over the orbits.

Dimensions of the type (measured in flesh) :—
Head and body 159 mm.; tail 209; hind foot 27; ear 26.
Skull: greatest length 42·3; condylo-basal length 41;

zygomatic breadth 22·6; nasals 19·5 × 5·6; interorbital breadth 7·1; palatal length 23·3; three anterior molariform teeth 6·7.

An older skull of similar length attains 25 mm. in zygomatic spread.

Hab. Trinidad. Type from Caparo.

Type. Adult male. B.M. no. 97. 6. 7. 24. Collected 18th January, 1897, by Dr. Percy Rendall.

The Trinidad *Marmosa* is a larger, stronger-coloured animal than its neighbours on Grenada and Tobago and than that on the opposite mainland which I assign to *M. mitis*, Bangs. The true *M. murina* of Guiana has much smaller teeth. *M. mitis* extends along the mountainous ranges from Santa Marta through Merida to Cumana, and appears to extend southwards into Colombia and Ecuador. The hairs of the sides of its belly are always conspicuously slaty at base, in contradistinction to the following form.

Marmosa mitis casta, subsp. n.

Size and other characters as in *M. mitis*, but nearly or quite the whole of the hairs of the under surface cream-coloured to their bases. If a few of the hairs on each side of the belly have slaty bases, these are quite hidden by the long cream-coloured ends, while in true *mitis* the area of slaty-based hairs is readily perceptible.

Skull as in *mitis*.

Dimensions of the type (measured in flesh) :—

Head and body 138 mm.; tail 190; hind foot 22; ear 27.

Skull: condylo-basal length 37·2; zygomatic breadth 20·5; three anterior molariform teeth 6·4.

Hab. San Esteban, Carabobo, N. Venezuela.

Type. Adult male. Original number 207. Collected 6th February, 1911, by Mr. S. M. Klages. Twelve specimens examined.

Marmosa dorothea, sp. n.

General appearance about as in *M. mitis casta*; skull-ridges as in *M. impavida*.

Colour above a rather pale "*murina*"-colour, paler than "cinnamon" and rather more suffused with "russet." Under surface wholly "cream-buff," the hairs light to their roots; line of demarcation on sides well marked. Hands and feet whitish. Tail grey, the end gradually becoming white or whitish.

Skull of the same long narrow shape as in *M. impavida*, Tsch., and the supraorbital edges similarly with fine narrow beadings parallel to each other, not thickened as in all the previous species, and not projecting laterally over the orbits. Teeth decidedly smaller than in *impavida*.

Dimensions of the type (measured in skin) :—

Head and body 130 mm.; tail 158; hind foot 18; ear 25.

Skull : greatest length 35·4; condylo-basal length 34·2; zygomatic breadth 17·6; nasals 16·8 × 4·3; interorbital breadth 6; breadth of brain-case 12·8; palate length 19·4; three anterior molariform teeth 5·7.

Hab. N.W. Bolivia. Type from Rio Solocame, 67° W., 16° S. Alt. 2300 m. Another specimen from Mapiri.

Type. Adult female. B.M. no. 1. 6. 7. 79. Original number 1329. Collected 26th January, 1901, by Perry O. Simons. Presented by Oldfield Thomas.

Readily distinguishable from its nearest ally, the *M. impavida* of Central Peru, with which it shares the general structure of the skull, by its wholly light belly and smaller teeth.

Marmosa parata, sp. n.

Allied to true *M. murina*, but teeth not so small.

More grey-brown than in most of the group of red Marmosas, the general colour above similar to, but considerably darker than, "wood-brown." Under surface "pinkish buff," the hairs of the belly slaty at base nearly or quite to the middle line. Dark orbital patch large, extending nearly to the tip of the nose. Hands and feet brownish white. Tail grey-brown to the tip.

Skull with broadly expanded zygomata. Interorbital region with angular ledges projecting over the orbits. Teeth larger than in true *M. murina*.

Dimensions of the type (measured in flesh) :—

Head and body 140 mm.; tail 180; hind foot 18; ear 24.

Skull : greatest length 35·8 : condylo-basal length 34·6; zygomatic breadth 20; nasals 15·2 × 5·1; interorbital breadth 6·2; breadth across postorbital processes 7·7; breadth of brain-case 13·7; palatal length 19·7; three anterior molariform teeth 5·8.

Hab. Para. Type from Igarapé-Assu. Alt. 50 m.

Type. Adult female. B.M. no. 4. 7. 4. 100. Original number 1879. Collected 12th May, 1904, by A. Robert. Presented by Oldfield Thomas.

LXII.—*List of Mammals from British East Africa, obtained by Mr. Robin Kemp and presented to the British Museum by Mr. C. D. Rudd, with additional Notes on Specimens collected and presented by Mr. A. Blaney Percival.* By Guy Dollman.

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The following is a list of the specimens collected by Messrs. Kemp and Percival during December 1910 and the early part of this year.

Xerus dabagala rufifrons, subsp. n.

♂. 94, 102; ♀. 85. Eusso Nyiro.

Similar to *X. dabagala*, but with rufous marking on muzzle extending back on to the head, and general colour of dorsal surface richer.

Size and general proportions as in *X. dabagala*. General colour of back bright yellowish red, speckled with black, the yellow tint gradually passing into the pinkish brown of the flanks. Back of head slightly darker than rest of dorsal surface and speckled with bright yellow and orange-red, very different from the greyish-brown head of *X. dabagala*. Muzzle and forehead bright orange-red (tan colour no. 2, 'Repertoire de Couleurs'), the reddish colour spreading on to the top of the head and mixing with the dark area on the back of the head. The orange-rufous tint is much brighter and more vivid than in *X. dabagala*, where the muzzle is more the colour of the flanks. Sides of muzzle, face, and neck bright orange-yellow (maize-yellow no. 4, 'Repertoire de Couleurs'), strikingly different from the white face and neck of *X. dabagala*. Ocular rings pure white. Flanks pinkish brown, speckled with white and black, the white speckling being due to the light tips and the black to dark roots of the hairs. Ventral surface and tail as in *X. dabagala*.

Skull similar to that of *X. dabagala*; rather broader across the interorbital region.

Dimensions of the type (measured in the flesh) :—

Head and body 205 mm.; tail 155; hind foot 54; ear 14.

Skull: greatest length 54·5; condylo-basilar length 45; zygomatic breadth 31; interorbital breadth 15·5; breadth of brain case (across squamosal region) 24; greatest length

of nasals 17·5 ; width of palate (inside m^1) 7·5 ; length of upper cheek-teeth 9·7.

Hab. Eusso Nyiro.

Type. Adult male. Original number 94. Collected by Mr. A. Blaney Percival on the 9th of January, 1911, and presented by him to the British Museum.

The bright orange rufous on the forehead and head and orange-coloured face are the chief characters wherein this form differs from *X. dabagala*.

Xerus dabagala dorsalis, subsp. n.

♂. 1356, 1357, 1358, 1365, 1376, 1401, 1402, 1405, 1406, 1408 ; ♀. 1369, 1371, 1377, 1387, 1404, 1409, 1410. Baringo.

Allied to *X. dabagala stephanicus*, Thos., from which it is distinguished by its much darker dorsal surface.

Size and general proportions as in the other members of this group. General colour of back dark olive, speckled with yellow and white, the general effect much darker than in *stephanicus*. Top of head black, speckled with pale buff and orange, rather darker than rest of dorsal surface and markedly different from the brownish head of *stephanicus*.

Orange rufous on nose and colouring of face much as in *stephanicus*. Flanks richer and darker, the black speckling rather more evident. Limbs, ventral surface, and tail similar to those of *X. d. stephanicus*.

Skull much as in *X. stephanicus*, broader across interorbital region ; auditory bullæ less inflated.

Dimensions of the type (measured in the flesh) :—

Head and body 239 mm. ; tail 192 ; hind foot 55·5 ; ear 12.

Skull : greatest length 54·5 ; basilar length 40·5 ; condylobasilar length 44·7 ; condylo-incisive length 47 ; zygomatic breadth 30 ; interorbital breadth 15 ; breadth of brain-case (across squamosal region) 24·6 ; greatest length of nasals 17·5 ; palatilar length 23·4 ; width of palate (inside m^1) 6·9 ; length of upper cheek-teeth 9·7.

Hab. Baringo, British East Africa. Altitude 4000 feet.

Type. Adult male. B.M. no. 10. 12. 19. 4. Original number 1376. Collected in October 1910.

This form, though evidently closely related to *X. d. stephanicus*, is readily recognized by the dark olive coloration of the dorsal surface and the blackish area on the top of the head. The rufous patch on the muzzle is similar to that of *stephanicus* and therefore renders this Baringo form easily

distinguishable from *X. dabagala rufifrons*, where the rufous area spreads on to the forehead and head.

Graphiurus microtis saturatus, Dollm.

♀. 1548, 1707. Solai, Mount Kenya.

Dipodillus diminutus, sp. n.

Allied to *Dipodillus harwoodi*, Thos., but smaller in size, with much smaller teeth, and more rufous in colour.

Size and proportions less than in *D. harwoodi*. General colour of upper surface bright orange-rufous (between bistre no. 3 and tan-colour no. 2, 'Repertoire de Couleurs'), slightly darker down the middle of the back, but not nearly so much as in *harwoodi*. Hairs of back with pale slate-grey bases, bright orange-buff subterminal rings, and short brownish tips. Flanks pure orange-buff in colour, hairs with light grey bases paling to white towards the tips; subterminal rings orange-buff, extreme tips of hairs brownish. Muzzle and top of head orange-buff, an indistinct dark line extending from the nose to the forehead. Cheeks and lips white, hairs white to roots. Sides of face below eyes buff, speckled with black. Ears clothed with short brownish hairs. Backs of hands and feet white. Entire under surface white; hairs of belly white to roots. Tail much as in *D. harwoodi*, rather shorter, but similar in colour.

Skull much smaller than that of *D. harwoodi*; with narrower brain-case, shorter nasals, smaller auditory bullæ, and very much smaller teeth.

Dimensions of the type (measured in the flesh):—

Head and body 67 mm.; tail 79; hind foot 20; ear 10.

Skull: greatest length 23·6; condylo-incisive length 20; zygomatic breadth 12·3; interorbital breadth 4·7; breadth of brain-case (across squamosal region) 11·2; length of nasals 9; width of palate (inside m^1) 2·8; length of palatal foramina 4·3; length of upper molar series 3·2.

Hab. Nyama Nyango, Eusso Nyiro. Altitude 3200 feet.

Type. Old male. Original number 1861. Collected on February 2nd, 1911.

This Gerbil is at once distinguishable from the Naivasha species, *D. harwoodi*, by its brighter colour, smaller size, and very much smaller teeth.

Taterillus tenebricus, sp. n.

Allied to *T. harringtoni*, Thos., but with dorsal surface

washed with a slate-black tint, and with rather larger hands and feet.

Size of body and tail as in *T. harringtoni*. General colour of back bright buff, washed over with slaty black, the black coloration most prominent on the back of the head. Posterior back and rump buff-coloured, the slaty-black tint only appearing in this region as a broad median stripe, but spreading out on the anterior back and shoulders. Hairs of back (in dark region) slaty black, with narrow subterminal buff-coloured rings; extreme tips blackish. Flanks bright yellowish buff (cinnamon no. 1, 'Repertoire de Couleurs'); hairs with slate-grey bases, paling to pure white and tipped with buff. Face with well-marked black stripe extending back from tip of nose to dark area on head. Sides of nose and face buff-coloured, eyes surrounded with buff-coloured hairs. Lips white. Backs of hands and feet white, the feet marked on the tarsal and metatarsal regions with buff. Under surface of body white, hairs of belly white to roots. Tail much as in *harringtoni*, but more hairy and blacker, underside markedly lighter than upper.

Skull much the same pattern as that of *harringtoni*; brain-case broader and molar teeth larger.

Dimensions of the type (measured in the flesh) :—

Head and body 92 mm.; tail 128; hind foot 30; ear 17·5.

Skull: greatest length 30; condylo-incisive length 26; zygomatic breadth 15·5; length of nasals 11·5; breadth of brain-case (across squamosal region) 9·6; length of upper molar series 5.

Hab. Nyama Nyango, Eusso Nyiro. Altitude 3200 feet.

Type. Subadult female. Original number 206. Collected on February 2nd, 1911, by Mr. A. B. Percival, and presented by him to the British Museum.

It is interesting to find a member of the genus *Taterillus* exhibiting the striking coloration met with in this species. Although agreeing in general proportions with *T. harringtoni*, the conspicuous dark markings on the back of this Eusso Nyiro form readily distinguish it from the Lake Rudolf species.

Tatera iconica, sp. n.

A light-coloured species allied to *T. vicina*, Pet.

Size and general proportions much as in *T. vicina*. Colour of dorsal surface pale buffy brown, washed with dark brownish on the posterior part of the back, the general effect very much lighter than in *T. vicina*, where the predominating

effect of the black hair-tips is most marked. Face and head pale buff-coloured, rather darker and redder on the back of head and neck (buff no. 2, 'Repertoire de Couleurs'). Sides of face and flanks pale buff (pale buff no. 1, 'Repertoire de Couleurs'); hairs with slate-grey bases, paling to white towards the tips, apical third buff-coloured. Ears clothed with short brownish and buff-coloured hairs; tips of ears greyish white. Backs of hands and feet and ventral surface of body white. Tail about as hairy as in *vicina*, much lighter above, the hairs on upper surface brownish red. Ventral surface of tail, like that of *vicina*, light anteriorly and darkening towards the tip.

Size of skull rather less than in *T. vicina*; molar teeth a good deal smaller.

Dimensions of the type (measured in the flesh):—

Head and body 145 mm.; tail 182; hind foot 35; ear 21·5.

Skull: greatest length 41; basilar length 31·2; condylo-incisive length 36·2; zygomatic breadth 21; interorbital breadth 7; breadth of brain-case (across squamosal region) 18; length of nasals 18; palatilar length 19; breadth of palate (inside m^1) 5; length of palatal foramina 7·5; greatest diameter of bullæ 11; alveolar length of upper cheek-teeth 6·5.

Hab. Nyama Nyango, Eusso Nyiro. Altitude 3000 feet.

Type. Old female. Original number 1799. Collected January 27th, 1911.

The light colour of the upper surface, both of the back and tail, of this Eusso Nyiro *Tatera* readily distinguishes it from the Kitui species, *T. vicina*, and, taking into consideration the cranial differences between the two forms, the Eusso Nyiro specimens must be regarded as specifically distinct.

Tatera nigricauda nyama, subsp. n.

Closely allied to *Tatera nigricauda*, Pet., but smaller in size and with a lighter-coloured tail.

Size rather less than in *T. nigricauda*, a feature more noticeable in the skull- than in the skin-dimensions. General colour of upper surface much as in *T. nigricauda*, the dark hair-tips not so prominent, the general effect a little lighter (buff no. 1 mixed with snuff-brown no. 2, 'Repertoire de Couleurs'). Flanks rather purer in colour (pale buff no. 1, 'Rep. de Coul.'), the grey bases of the hairs much lighter, in some cases being almost white. Backs of hands and feet and entire ventral surface white. Tail very similar to that of *nigricauda*, but hairs lighter and browner, the general

effect produced being that of a reddish-brown tail, and not of a black one.

Skull a great deal smaller than that of *nigricauda*, shorter and narrower; markedly shorter nasals and narrower brain-case. Auditory bullæ much smaller and shorter.

Dimensions of the type (measured in the flesh) :—

Head and body 164 mm.; tail 208; hind foot 40·5; ear 22.

Skull: greatest length 48; basilar length 36·8; condylo-incisive length 42; zygomatic breadth 24·7; interorbital breadth 8·6; breadth of brain-case (across squamosal region) 17·5; length of nasals 20·5; palatilar length 21·5; width of palate (inside m^1) 4·3; length of palatal foramina 9; greatest diameter of bullæ 12·5; alveolar length of upper cheek-teeth 7·2.

Hab. Nyama Nyango, Eusso Nyiro. Altitude 3000 feet.

Type. Old male. Original number 1798. Collected on January 27th, 1911.

The much smaller size of the skull and lighter-coloured tail are the chief points wherein this new form differs from the Mombasa species. I have taken as representing *T. nigricauda* a long series of specimens recently obtained by Mr. Kemp at Voi and Taveta. The following are the cranial dimensions of an adult male :—

Greatest length 51 mm.; basilar length 40; condylo-incisive length 45·3; zygomatic breadth 26·8; interorbital breadth 9; breadth of brain-case (across squamosal region) 20; length of nasals 23; palatilar length 23·6; length of palatal foramina 10; greatest diameter of bullæ 14; alveolar length of upper cheek-teeth 7·5.

Tatera varia, described by Heller from the Eusso Nyiro River, Sotik District, would appear to be the only other member of the genus described from this district. *T. varia* belongs to the *fallax* group with the white-tipped tails, and is in no way related to *nigricauda* or the form here described.

Otomys irroratus elgonis, Wrought.

♂. 1523, 1526, 1527, 1531, 1567, 1571, 1582, 1583, 1595, 1596, 1617, 1618, 1637, 1641, 1642, 1655, 1663, 1668, 1714, 1715; ♀. 1522, 1572, 1597, 1658, 1710. Solai, Mt. Kenya.

Otomys angoniensis elassodon, Osg.

♂. 1312, 1315, 1316; ♀. 1307, 1314. Nakuru.

♂. 1421, 1423, 1438, 1448, 1450, 1457, 1478, 1481, 1502, 1514, 1506; ♀. 1422, 1458, 1459, 1475, 1485, 1497, 1498, 1499, 1515, 1516. Rumruti, Laikipia Plateau.

Dendromus insignis, Thos.

♂. 1633, 1647, 1664, 1680, 1697, 1713; ♀. 1542, 1660, 1720. Solai, Mt. Kenya.

Epimys denniæ, Thos.

♂. 1537, 1544, 1545, 1631, 1648, 1703, 1727; ♀. 1570. Solai, Mt. Kenya.

Epimys jacksoni, de Wint.

♂. 1549, 1550, 1557, 1562, 1569, 1627, 1639, 1649, 1702, 1717, 1722; ♀. 1577, 1601, 1608, 1693. Solai, Mt. Kenya.
♂. 1490; ♀. 1483. Rumruti, Laikipia Plateau.

Epimys medicatus, Wrought.

♂. 1500, 1503; ♀. 1487, 1507, 1508. Rumruti, Laikipia Plateau.
♂. 1339, 1351, 1360. Baringo.

Epimys effectus, sp. n.

Similar in general colouring to *E. ugandæ*, de Wint., but smaller in size.

Size and general proportions less than in *E. ugandæ*; hind foot markedly smaller, measuring only 22 or 23 mm. in length, while in *E. ugandæ* the hind foot is much larger, measuring about 26 or 28 mm. in length. Tail rather short compared with that of *E. ugandæ*. Size of body small. General colour of upper surface brownish buff, the effect being very much as in *Apodemus sylvaticus*, but rather yellower. Hairs all with slate-grey bases, buff-coloured subterminal rings and dark tips, the dark hair-tips most prominent down the middle of the back. Flanks yellowish buff, faintly speckled with brown, the buffy tint passing abruptly into the white coloration of the ventral surface. Sides of face and neck bright buff-coloured. Backs of hands and feet white. Entire underparts, as in *E. ugandæ*, greyish white; hairs of belly all with slate-grey bases and whitish tips. Tail, as in the other members of the multi-mammate group, almost naked and rather darker above than below.

Skull markedly smaller than in *ugandæ*, shorter and considerably narrower across the zygomatic region. Auditory bullæ and teeth smaller.

Dimensions of the type (measured in the flesh) :—

Head and body 139 mm.; tail 124; hind foot 23·5; ear 18.

Skull: greatest length 32·1; basilar length 26·6; condylo-incisive length 31; zygomatic breadth 15; breadth of brain-case (across squamosal region) 12·5; interorbital breadth 4·7; greatest length of nasals 13·5; palatilar length 15; width of palate (inside m^1) 3·2; length of palatal foramina 8; alveolar length of upper molar series 5·2.

Hab. Baringo. Altitude 4000 feet.

Type. Old female. B.M. no. 10.12.19.27. Original number 1353. Collected on October 10th, 1910.

The smaller size of this species is at once sufficient to distinguish it from de Winton's *E. ugandæ*. This new form appears to be fairly widely distributed and to occur side by side with the larger species, as is evident by examination of the series of specimens in the Museum collection. Both species were obtained by the Ruwenzori Expedition, and Mr. Kemp has collected *E. ugandæ* and *E. effectus* at Mumias and Mt. Elgon. There is a considerable range of variation in size and colour presented by the series of specimens from Elgon and Ruwenzori, but not sufficient to indicate that they represent more than one species. As regards the other known forms of this group, the coast species, *E. hildebrandti*, is rather similar in size to *E. effectus*, but greyer and lighter in colour. *E. panya*, recently described by Heller from the Athi Plains, appears to resemble this new species in general colour, except that the dorsal and ventral surfaces in *panya* are described as merging gradually into one another, whereas in *effectus* there is a distinct line of demarcation between the rich buffy tint of the flanks and the white under surface. The dimensions of the two species are also conspicuously different.

It is evident from Heller's description of *E. panya* that it is not generally known that the type specimen of *ugandæ* is a young individual, and to this fact are due both its dark colouring and small size. In the Museum collection is a series of adult specimens from Entebbe, the type locality, received since de Winton described the species, and the following brief description of the appearance of *E. ugandæ* in the adult phase may not here be out of place:—

Size rather large, hind foot measuring 27 or 28 mm. in length.

General colour of back dark brown washed with buff, rather darker and blacker down the back and more buffy on the flanks. Buffy tint on flanks gradually merging into the greyish-white underparts. Sides of base buffy orange. Hands and feet white. Underparts dirty white, hairs with

slate-grey bases and buffy-white tips. Tail as in the other species of the group.

Skull large and broad, with fairly large molars and broad brain-case.

Dimensions (measured in flesh) :—

Head and body 140 mm.; tail 135; hind foot 28; ear 22.

Skull: greatest length 34·3; basilar length 29; condylo-incisive length 33; zygomatic breadth 16·8; interorbital breadth 4·9; length of nasals 14; palatilar length 15·4; width of palate (inside m^1) 3·2; length of palatal foramina 7·6; length of upper molar series 5·9.

The Entebbe specimens of *ugandæ* exhibit a considerable degree of variation in colour, as do a similar series of this species from Mt. Ruwenzori, and it is evident that, like the smaller form described above, de Winton's species is subject to much variation in colour.

It is interesting to note that while the young individuals of *E. ugandæ* are dark blackish in colour, the juvenile pelage of *E. effectus* is ashy grey.

Epimys evelyni, sp. n.

A pale greyish-yellow-coloured species, about equal in size to *E. ugandæ*, and probably allied to same.

Size and general proportions much as in *E. ugandæ*, hind foot and tail rather shorter. General colour of dorsal surface pale greyish buff, tinted with brownish buff down the middle of the back. Hairs of back with slate-grey bases, buffy subterminal rings, and dark brownish tips. Flanks and sides of face pale grey, washed over with a light buffy tint, the buff-coloured area merging rather sharply into the light colour of the ventral surface. Ears covered with minute greyish hairs; a light orange patch of hair at anterior insertion of ear. Backs of hands and feet dirty white. Ventral surface of body greyish white, the general effect lighter than in *E. ugandæ*. Hairs of belly with pale grey bases and white tips. A light buffy suffusion down middle of belly, but by no means as marked as in the allied species. Tail rather short, almost naked, less hairy than in *ugandæ*; rather darker above than below.

Skull a trifle smaller than that of *E. ugandæ*. Muzzle narrower. Palatal foramina long.

Dimensions of the type (measured in the flesh) :—

Head and body 142 mm.; tail 121; hind foot 26; ear 19·7.

Skull: greatest length 33·6; basilar length 27·7; condylo-incisive length 31·6; zygomatic breadth 16; interorbital breadth 4·7; breadth of brain-case (across squamosal region) 13; length of nasals 14; palatilar length 15·2; width of palate (inside m^1) 3; length of palatal foramina 8·2; length of upper molar series 5·8.

Hab. Baringo. Altitude 4000 feet.

Type. Old male. B.M. no. 10. 12. 19. 30. Original number 1333. Collected on October 7th, 1910.

This species is readily recognized by the pale greyish-olive colour of the dorsal surface and light buffy-grey flanks. The most nearly allied species appears to be *E. ugandæ*, which agrees with this new form as regards the dimensions of the body, but differs in its longer hind foot and tail and rather large skull, in addition to the striking colour differences already referred to. The other Baringo species, described above, apart from its much richer coloration, is at once distinguished by the smaller size of the hind foot and skull.

Leggada grata, Thos.

♂. 1679; ♀. 1670. Solai, Mt. Kenya.

Leggada triton, Thos.

♂. 1603, 1615, 1620, 1624, 1626, 1632, 1646, 1684; ♀. 1528, 1555, 1598, 1610, 1611, 1612, 1613, 1614, 1625, 1657, 1671. Solai, Mt. Kenya.

Thamnomys gigas, sp. n.

A large richly coloured species with a very massive skull. In size and general proportions about as in *T. ibeanus*, Osg., tail especially long. General colour of back olive-grey washed with tawny buff, the reddish tint increasing posteriorly, on the hind-quarters and rump becoming bright orange-red (tan colour no. 1, 'Repertoire de Couleurs'), the general effect being much as in the West African *T. rutilans*, but rather darker. Head, sides of face, neck, and shoulders washed with yellowish buff. Flanks richly tinted with orange-buff and sharply marked off from the white underparts. Backs of hands and feet buff-coloured. Entire under surface white, tinted with very pale pinkish buff, the general colour appearing as almost white. Tail long and rather more hairy than in *T. ibeanus*.

Skull very large and massive. Brain-case much larger

than in the allied species. Zygoma stout and heavy. Palatal foramina very long. Auditory bullæ large and slightly inflated. Molar teeth exceptionally large, the tooth-row much longer and broader than in *T. ibeanus* or any of the *surdaster* group.

Dimensions of the type (measured in the flesh) :—

Head and body 132 mm.; tail 201; hind foot 26·5; ear 19.

Skull: greatest length 35·5; basal length 29·5; basilar length 27·5; condylo-basilar length 29·8; condylo-incisive length 31·8; zygomatic breadth 16·9; interorbital breadth 5; breadth of brain-case (across squamosal region) 14; greatest length of nasals 12·7; palatilar length 14·5; width of palate (inside m^1) 3; width across palate (outside m^1) 6; length of palatal foramina 7·9; post-palatal length 13·3; length of upper molar series 5·5.

Hab. Solai, Mt. Kenia. Altitude 9000 feet.

Type. Adult male. Original number 1712. Collected on December 28th, 1910.

This large species is distinguished at once from all the allied forms by the far greater size of the skull. A further specimen referable to the same species was collected by Mr. J. L. Clark at Kasituka, west of Mt. Kenya.

Thamnomys surdaster insignis, subsp. n.

♂. 1517; ♀. 1467. Rumruti, Laikipia Plateau.

♂. 445, 451; ♀. 427, 433, 446. South face of Mt. Elgon.

Rather smaller in size than *T. ibeanus*, Osg., but much redder in colour and allied to *T. surdaster polionops*, Osg.

General colour of back much as in *T. surdaster*, but darker and less richly coloured anteriorly; the entire dorsal surface washed with tawny buff, richer on the posterior portion of the body. General colour of hind-quarters reddish buff (brownish terracotta no. 2, 'Repertoire de Couleurs'). Flanks pale olive-grey, strongly tinted with pinkish buff, sharply marked off from the white underparts by a pale buff-coloured line, formed by the pinkish-buff tips of the hairs of the flanks overlapping the white hairs of the belly. Hairs of back and flanks all with dark slate-grey bases. Face and head much as in *T. ibeanus*, but more buffy. Backs of hands and feet white, washed with buff. Entire underparts white; hairs wholly white. Tail long and hairy, about as in *T. ibeanus*.

Skull much as in *T. surdaster*, rather larger in size, though not so large as in *T. ibeanus*.

Dimensions of type (measured in the flesh) :—

Head and body 120 mm.; tail 185; hind foot 25; ear 22.

Skull: greatest length 32·5; basilar length 25·5; condylo-basilar length 27·5; condylo-incisive length 29·7; zygomatic breadth 14·7; interorbital breadth 4·5; breadth of brain-case (across squamosal region) 13; length of nasals 12; palatilar length 14; post-palatilar length 11·7; width of palate (inside m^1) 2·5; length of palatal foramina 7·4; length of upper cheek-teeth 4·7.

Hab. South face of Mt. Elgon. Altitude 9000 feet.

Type. Adult female. B.M. no. 10. 4. 1. 186. Original number 433. Collected on November 13th, 1909.

I have taken for the type of this new form a specimen from a series collected by Mr. Kemp in 1909 on Mt. Elgon; the only adult Rumruti example has an imperfect skull, but it undoubtedly is the same form as that found at Elgon.

The bright tawny colour of the dorsal surface and buffy tint on the flanks readily distinguish this race from *T. ibeanus*, a species that is noted for its dull olive-coloured pelage. *T. surdaster polionops*, Osg., a more southern race related to this Elgon form, is less tawny on the sides of the face and flanks; and the general colour of the dorsal surface, although distinctly reddish, is a good deal lighter.

T. surdaster elgonis, Thos., geographically the nearest ally of *T. s. insignis*, is far paler and yellower in colour and smaller in size.

T. loringi, described by Heller in 1909 from Lake Naivasha, is apparently quite unlike any other known member of the genus, possessing dark facial stripes (like those of *Epimys nigricauda*) and slate-grey bases to the hairs of the belly. As regards *T. surdaster*, the general colour of the dorsal surface and flanks is brighter and rather lighter in colour than in this new form, a character that is especially noticeable on the shoulders, neck, and head. In addition, *T. surdaster* is a rather smaller animal, the hind foot measuring only 22 mm. in length.

Lophuromys zena, Dollm.

♂. 1524, 1529, 1546, 1551, 1558, 1560, 1573, 1574, 1576, 1586, 1653; ♀. 1525, 1547, 1552, 1559, 1563, 1575, 1635, 1649. Solai, Mt. Kenia.

This series of specimens is quite similar to the series from the Aberdare Mountains, the type locality.

LXIII.—*Descriptions of new African Heterocera.*

By G. T. Bethune-Baker, F.L.S., F.Z.S.

Syntomidæ.

Ceryx flava, sp. n.

♂. Antennæ dark brown. Head, thorax, and abdomen uniform chrome-yellow. Legs dark brown. Primaries brown where not hyaline; all the cell and nearly all below the cell to vein 1 *a* hyaline, angle of veins 7 and 8 hyaline, internervular area between 6 and 7 hyaline for two-thirds, area between 5 and 6 nearly filled in with brown but not quite, a hyaline ovate spot on each side of vein 4, angle of vein 2 hyaline. Secondaries with basal area yellow, outer half greyish brown, no hyaline spots at all.

Expanse 29 mm.

Hab. N'Dalla Tando, N. Angola, 2700 feet; November (*Ansorge*).

Type in my collection.

Syntomis tripunctata, sp. n.

Antennæ with white tips. Head, thorax, and abdomen uniform greenish black. Primaries greenish black, with a small hyaline spot in the cell, one above vein 6, and one below it, below vein 4. Secondaries, a minute dot beyond the cell.

Expanse 23 mm.

Hab. N'Dallo Tando, N. Angola, 2700 feet; December (*Ansorge*).

Type in my collection.

Syntomis dissimilis, sp. n.

Antennæ all black. Head, thorax, and abdomen blue-black, the latter with the two middle segments dull red, with a similar coloured fine lateral line from them to the thorax. Both wings bluish black. Primaries with a hyaline quadrate spot below the cell, a large spot filling the apical half of the cell, below which is a large subquadrate spot, a spot above vein 6, two ovate spots, one on each side of vein 4. Secondaries: a large basal spot extending into the cell, another beyond the cell divided by vein 3. Fringes to both wings brown.

Expanse 33 mm.

Hab. Laikipia, East Equatorial Africa; June (*Jackson*).

Type in my collection.

Allied to *S. consimilis*, Hmpsn.

Syntomis n'tebi, sp. n.

Antennæ tipped with white. Head, thorax, and abdomen blackish, the latter with three segments banded with red. Both wings brownish black. Primaries with a small round spot below the cell, a larger one at the end of the cell, below which a little inwards is an elongate one; an oval spot above vein 6, and an oval one between veins 3 and 4 and 4 and 5. Secondaries with a roundish basal spot and a round spot beyond the cell.

Expanse 35 mm.

Hab. N'tebi, Uganda (*Jackson*).

Type in my collection.

Allied to *S. borguensis*, Hmpsn.

Eressades, gen. nov.

Antennæ bipectinate to tip, with long branches and cilia; palpi and proboscis absent, minute spurs on hind tibiæ only. Neuration: primaries, vein 2 from middle of cell, 3 from before the angle, 4 from angle, 5 from well above the angle, 6 from upper angle, 7, 8, 9, 10 stalked. Secondaries normal in shape, with vein 2 from a third before the angle, 3 from before the angle, 4 from the angle, 5 from the middle, 6 and 7 coincident.

Type, *Eressades flavipunctata*, B-B.

Eressades flavipunctata, sp. n.

♂. Antennæ brown; head yellow; thorax brown, with small yellow patagia and centre of metathorax yellow; abdomen yellow; legs brown. Both wings greyish brown with straw-yellow spots. Primaries with a subquadrate spot below the cell, a triangular spot in the cell at its upper extremity, a round spot above vein 6, one on each side of vein 4. Secondaries with basal spot in the cell and below it, beyond the cell a spot on each side of vein 4.

Expanse 26 mm.

Hab. N'Dalla Tando, N. Angola, 2700 feet; December (*Ansorge*).

Type in my collection.

Euchromia jacksoni, sp. n.

♀. Head, antennæ, thorax, and abdomen black, the latter with a pale yellowish spot on each side of the proximal segment, two lateral metallic-blue dashes on the next two segments, on the dorsal and on the ventral surfaces, which are separated; a small metallic spot on the dorsum of each segment also: a red lateral patch on the following segment

and a red spot on the dorsum, ventral surface of this segment banded with white; the remaining segments barred laterally with metallic-blue on both dorsal and ventral portions; similar coloured small spots on the centre of the dorsum also; on each side of the dorsum is a deep black stripe dividing all the markings as described. Both wings brownish black, with straw-yellow hyaline patches. Primaries with a large spot below the cell and a small one in it; a series of four confluent spots beyond the cell divided by the veins, the two upper small, the two lower large spots. Secondaries with a small basal elongated spot in the cell and one below it, a very large spot beyond the cell extending into the angles of vein 3.

Expanse 52 mm.

Hab. Entebbe, Uganda; December (*Jackson*).

Type in my collection.

Metarctia rosacea, sp. n.

♂. Antennæ cream-colour. Head, palpi, thorax, abdomen, and legs pale pink. Both wings pink. Primaries marked with very pale brownish, a subbasal angled stripe across the cell and fold, followed by a curved one in the cell and into the interneural area of veins 2 and 3, a mark across the end of the cell; a postmedian waved fascia confluent with the interneural brownish area between veins 2 and 3; veins brownish; fringes pale brown. Secondaries very pale pink with pink fringes.

Expanse 37 mm.

Hab. N'Dalla Tando, N. Angola, 2700 feet; December (*Ansorge*).

Type in my collection.

Metarctia pallens, sp. n.

♂. Palpi and antennæ brown; head, thorax, and abdomen dirty yellowish. Legs brown. Primaries very pale washed-out straw-colour, with the costa and upper margin of cell brown; a brown angled dash across the end of the cell, a broadish brown stripe, rather indefinite as to area, along vein 1 *a*. Secondaries palest straw-colour, inclined to be hyaline about the cell.

Expanse 40 mm.

Hab. N'Dalla Tando, N. Angola, 2700 feet; November (*Ansorge*).

Type in my collection.

Metarctia diversa, sp. n.

♂. Palpi and antennæ brown; head pale pinkish brown;

thorax pale brownish : abdomen pinkish ochreous. Legs brown. Primaries uniform brownish grey slightly tinged with pink, with a dark grey mark across the end of the cell ; costa finely pink. Secondaries very pale pinkish, inclined to be hyaline at the base.

Expanse 46 mm.

Hab. N'Dalla Tando, N. Angola, 2700 feet; October (*Ansorge*).

Type in my collection.

Metarctia contrasta, sp. n.

♂. Face and head rose-colour, collar smoke-brown edged with rose-colour, antennæ sooty brown ; thorax sooty brown, with a metathoracic tuft of rose-colour ; abdomen uniform rose-colour, ventral surface brown with yellow segmental divisions. Legs brown. Primaries uniform dark sooty grey with yellow fringes. Secondaries creamy white, semi-diaphanous.

Expanse 42 mm.

Hab. N'Dalla Tando, N. Angola, 2700 feet ; November (*Ansorge*).

Type in my collection.

Near *M. flavicincta*, Auriv., but the rose-coloured head, collar, and abdomen easily distinguish it.

Metarctia rubrilineata, sp. n.

♂. Head, antennæ, thorax, and abdomen uniform umber-brown. Legs yellowish brown tinged with pink ; ventral surface yellowish. Both wings uniform umber-brown. Primaries with a red subcostal line for four-fifths of the costa, a small red spot near the end of the cell and another beyond it, a red spot below the angle of vein 2. Secondaries spotless.

Expanse 36 mm.

Hab. N'Dalla Tando, N. Angola, 2700 feet; November (*Ansorge*).

Type in my collection.

Metarctia rubribasa, sp. n.

♀. Head red, antennæ black, collar, thorax, and abdomen pinkish brown. Primaries pinkish brown, with the base very restricted rosy ; costa very finely pale pinkish. Secondaries uniform deep cream tinged with pink.

Expanse 42 mm.

Hab. N'Dalla Tando, N. Angola, 2700 feet ; December (*Ansorge*).

Type in my collection.

Metarctia uniformis, sp. n.

♂. Head and thorax yellow; abdomen paler yellowish; antennæ brown. Legs brown. Primaries uniform pale sooty brown, slightly darker along the costa and the inner margin. Secondaries creamy white.

Expanse 32 mm.

Hab. Malange, Portuguese W. Africa; December.

Type in my collection.

Near *M. flavicincta*, Auriv.

Arctiadæ.

Lithosianæ.

Nola angola, sp. n.

♀. Head and thorax white; abdomen grey. Primaries with base white, narrowly grey at costa; median area and all the rest of the wing dark grey, except a white subovate costal patch from the end of cell into the apex, the terminal area being very dark; there is a trace of a dark postmedian and angled subterminal line across the ovate white patch. Secondaries grey, whitish towards the base.

Expanse 24 mm.

Hab. N'Dalla Tando, 2700 feet; November (*Ansorge*).

Type in my collection.

Chionæma rubritermina, sp. n.

♂. Head, thorax, and abdomen white. Both wings pure white. Primaries with three fine blood-red lines, viz., median one slightly angulated, postmedian very deeply projected outwards between veins 3 and 4, the third being a terminal line; a black spot in the cell followed by another at the end of the cell; costa with a small subbasal spot and another below it at the base of the cell, a subcostal spot just outside the postmedian line.

Expanse 20 mm.

Hab. Oni (Lagos); April.

Type in the Oxford Museum.

Ilema melanosticta, sp. n.

♂. Head and pectus yellow, antennæ yellow with dark shafts. Collar yellow; thorax white with yellowish patagia; abdomen yellow. Both wings pure white. Primaries with costa very finely black to the costal spot, a deep black subcostal spot just beyond the centre, a second below it shifted slightly inwards below the angle of vein 2. Secondaries quite spotless.

♀. Like the male.

Expanse 40 mm.

Hab. N'Dalla Tando, N. Angola, 2700 feet ; November (*Ansorge*).

Type in my collection.

This is near *T. eningæ*, Plötz, but its pure white wings and yellow head and abdomen will distinguish it.

Ilema diplisticta, sp. n.

♂. Head, thorax, and abdomen yellowish. Primaries creamy white, with more colour at the base and on the fold, an indistinct dark spot on the costa just beyond the centre and another distinct one below it, shifted slightly outwards below vein 2. Secondaries spotless dirty white.

♀. Primaries darkish grey, with both spots distinct. Secondaries paler grey and spotless.

Expanse, ♂ 30, ♀ 36 mm.

Hab. Gunnal (W. Africa) ; June.

Types in my collection.

Ilema triplaiola, sp. n.

♂. Head and thorax pale tawny ; abdomen grey, terminal segments yellowish. Primaries tawny ochreous (best described perhaps as deep buff), with the base paler and slightly paler beyond the median area ; a small dark spot at the end of the cell, another on vein 2 shifted inwards, below which is another indistinct one on the inner margin ; a few scattered dark scales in the postmedian area. Secondaries clear, spotless, pale yellowish.

Expanse 27 mm.

Hab. N'Dalla Tando, N. Angola, 2700 feet ; November (*Ansorge*).

Type in my collection.

Ilema malanga, sp. n.

♂. Head yellowish, thorax and abdomen grey. Primaries pale lemon-yellow, with the median area deeper yellow, inclined to an orange shade, a small dark point about the middle of vein 2. Secondaries very pale lemon-yellow.

Expanse 28 mm.

Hab. Malange, W. Africa.

Type in my collection.

Ilema unistrigata, sp. n.

♂. Head, thorax, and abdomen yellow, the latter the palest. Primaries pale straw-colour, with a single waved confluent spotted grey stripe across the end of the cell. Secondaries very pale clear yellowish.

Expanse 30 mm.
Hab. Gunnal (W. Africa); June.
Type in my collection.

Ilema bisticta, sp. n.

♂. Head and thorax yellowish, abdomen pale greyish. Primaries dirty yellowish, with a dark grey spot near the lower angle of the cell and another below it shifted inwards below vein 2; subterminal area with fine dark scattered scales. Secondaries semitransparent very pale lemon-yellow.
Expanse 30 mm.
Hab. Malange, W. Africa; October.
Type in my collection.

Ilema minutissima, sp. n.

♂. Head, thorax, abdomen, and legs dirty white. Primaries creamy white without any markings. Secondaries uniform milky white.
Expanse 18 mm.
Hab. Gunnal, W. Africa; June.
Type in my collection.

Ilema celida, sp. n.

♂. Head, thorax, and abdomen ochreous grey. Primaries uniform ochreous grey, with a dark spot in the cell on the discocellulars. Secondaries creamy ochreous, paler than the primaries, quite markless.
Expanse 22 mm.
Hab. Gunnal, W. Africa; November.
Type in my collection.

Ilema squamosa, sp. n.

♂. Head yellowish, thorax and abdomen dark grey. Primaries pale straw-colour without any pattern, but more or less covered with very fine darkish scales. Secondaries pale creamy-white.
Expanse 24 mm.
Hab. Malange, W. Africa; November.
Type in my collection.

Anaphosia parallela, sp. n.

♂. Head orange-yellow, thorax pearly white, a central deep orange spot on collar and fore part of thorax; abdomen yellowish grey. Primaries pearly white, tinged with pale straw, so as just to prevent it being white. Costa very finely black, a median and postmedian waved and curved fine black line parallel with each other. Secondaries the same colour as the primaries.

♀. Like the male, but with the secondaries yellower.

Expanse, ♂ 34, ♀ 42 mm.

Hab. N'Dalla Tando, N. Angola, 2700 feet; October (*Ansorge*).

Types in my collection.

Asura crenulata, sp. n.

♂. Head, thorax, and abdomen pinkish yellow. Primaries pinkish yellow, with pinkish-grey spotted lines; an oblique basal line followed by a parallel subbasal one, an irregular short line across the cell near its end, a small spot at the upper angle of the cell, a broad postmedian crenulate line, followed by an irregular subterminal one; termen with fine internervular dark dashes. Secondaries clear semihyaline pale lemon-yellow.

Expanse 24 mm.

Hab. N'Dalla Tando, N. Angola, 2700 feet; December (*Ansorge*).

Type in my collection.

Near *A. obliterata*, Wlk.

Asura pectinata, sp. n.

♂. Head, thorax, and abdomen pinkish, antennæ with long black branches and pinkish shaft. Primaries pink, basal area with a yellowish tinge with pinkish-grey spotted lines, an antemedian strongly curved line, a median line with a sharp angle in the cell, a strongly curved almost double postmedian line; a subterminal line of irregular isolated spots. Secondaries pale pinkish.

Expanse, ♂ 20, ♀ 26 mm.

Hab. N'Dalla Tando, N. Angola, 2700 feet; November (*Ansorge*).

Type in my collection.

Asura xantha, sp. n.

♂. Head, thorax, and abdomen pale yellow. Primaries yellow, with an irregular curved pinkish-grey basal line; a deeply dentate median line, followed by an oblique curved crenulate line, a subterminal dot on veins 4 and 6; termen and fringe yellow. Secondaries very pale yellowish, somewhat transparent.

Expanse 18 mm.

Hab. N'Dalla Tando (N. Angola), 2700 feet; November (*Ansorge*).

Type in my collection.

Miltochrista hieroglyphica, sp. n.

♂. Head, thorax, and abdomen yellow. Primaries pale

yellowish tinged with pink in parts, with basal and median lines broad, adversely oblique, joined together in the cell by a broadish dash; postmedian line broad, very strongly elbowed outwards in the subapical area, receding rapidly to vein 2, then erect to the inner margin; three subterminal small spots about veins 3, 5, and 9 (one on each), all the marks are pinkish grey. Secondaries subhyaline pinkish yellow.

Expanse 21 mm.

Hab. N'Dalla Tando.

Type in my collection.

Arctianæ.

Acantharctia aureacosta, sp. n.

♂. Palpi, head, and face yellow; collar and thorax dead white; abdomen yellow, with black dorsal bars; legs yellow. Both wings dead white. Primaries with costa yellow and fringes paler yellow. Secondaries with white fringes.

Expanse 34 mm.

Hab. Gunnal, W. Africa; June.

Type in my collection.

Between *A. flavicosta*, Hmpsn., and *nivea*, Aur.

Noctuidæ.

Noctuinæ.

Tathorhyncus leucobasis, sp. n.

♂. Head and thorax greyish brown; abdomen greyish. Both wings brownish grey; costa with a sparse scattering of paler grey very fine scales, orbicular and reniform stigmata scarcely darker than the ground; fringes greyish white. Secondaries with the cell cream-colour and whitish-grey fringes.

♀. Primaries paler grey, with yet paler scales on the costa and internervular terminal spaces; a dark dash in the cell; cell closed by a dark double spot; a waved line of dark scales on the fold. Secondaries deep cream at the base, with apex and termen broadly dark grey.

Expanse 32 mm.

Hab. Nairobi, Molo Railway Station; July (*Jackson*).

Type in my collection.

Rhanidophora flava, sp. n.

♂. Head and thorax orange-yellow; abdomen rather paler yellow, ventral surface brown. Primaries deep cream-colour, the basal two-thirds to vein 1 *a* covered with orange-coloured scales; an oval whitish spot encircled with black near the

base of the cell; a similar smaller round spot at the upper angle of the cell and a pear-shaped similar spot at the lower angle; a postmedian row of orange dashes filling in the internervular spaces, and continued by a second confluent rather paler row of dashes almost up to the termen; termen pale cream; fringes orange-colour. Secondaries pale chrome-yellow, the basal two-thirds with dark grey irrorations.

Expanse 50 millim.

Hab. Mount Elgon; July. Uganda Protectorate.

Type in my collection.

Capnodes albicosta, sp. n.

♀. Head and thorax dull cinnamon-brown; collar white; abdomen darker brown. Both wings dull cinnamon-brown, with slightly darker lines. Primaries with nearly the whole length of costa narrowly white, but very prominent; the whole area has the appearance of being very finely irrorated with minute pale scales, in which the antemedian, median, and postmedian irregular and fine lines stand out clear brown, with also a trace of a subterminal line. Secondaries similar to the primaries but paler, and the lines only discernible obscurely.

Expanse 46 mm.

Hab. Lagos.

Type in the Hope Museum.

I put this with some doubt in this genus, though the palpi and shape of wings do not altogether agree.

Homodes hæmorrhanta, sp. n.

♂. Head and thorax reddish; abdomen ochreous, tinged with reddish. Both wings red, with grey lines. Primaries with a distinct but indefinite median line slightly excurved; postmedian line fine, boldly waved; subterminal line irregular, indented, and with small spots in it; termen with dark internervular points; costa narrowly grey. Secondaries with line similar to the primaries, but finer and much less definite.

Expanse 36 mm.

Hab. Lagos.

Type in the Hope Museum.

Deltoidinæ.

Eucapnodes megalosara, sp. n.

♂. Head and thorax umber-brown, abdomen greyer. Both wings umber-brown, with dark greyish markings. Primaries with antemedian line projected outwards in the cell; a black-

ringed white point in the cell over the lower part of the line; postmedian line sharply crenulate, receding on the fold; termen with fine black internervular points; a white point beyond the cell in the crenulate line, three white costal points beyond that line, and below these a dark indefinite cloudy patch. Secondaries with a dark dot in the cell; a median crenulate line; termen with dark internervular points.

Expanse 50 mm.

Hab. Lagos.

Type in the Hope Museum.

Catada rex, sp. n.

♀. Head blackish; collar, thorax, and abdomen orange, the latter fading into grey beyond the middle. Primaries with the costa finely black and the posterior half of the wing also blackish, the basal half being orange. Secondaries with the basal two-thirds orange, the posterior third blackish.

Expanse 32 mm.

Hab. Oni (Lagos).

Type in the Hope Museum.

This species is close to *C. ducalis*, Schaus, but the yellow areas are not the same.

Lymantriadæ.

PSEUDARCTIA, gen. nov.

Palpi hairy, small; antennæ shortly pectinate in female. Neuration: primaries with vein 2 from near the middle of the cell, 4 from the angle, 3 and 5 from close to the angle, 6 from the upper angle; 7, 8, 9, and 10 stalked, 10 at a quarter from the cell, 7 from beyond the middle; 11 free from the cell. Secondaries with 4 from the angle, 3 and 5 from close to the angle, 6 and 7 from the upper angle, 8 bent down to the cell and touching very shortly.

Type, *Pseudarctia nivea*, B-B.

Pseudarctia nivea, sp. n.

♀. Head, thorax, and abdomen white; antennæ blackish; legs white, femora red laterally, tibiæ and tarsi brown laterally. Both wings pure white, without any mark at all.

Expanse 52 mm.

Hab. N'tebi (Uganda).

Type in my collection.

Leucoma albifrons, sp. n.

♂. Head, thorax, and abdomen pearly white; antennæ

yellowish, with white shafts. Both wings pearly white. Primaries more lustrous than the secondaries, the only mark being a short fine black dash closing the cell.

Expanse 22 mm.

Hab. Oni (Lagos); April.

Type in the Hope Museum.

Next *L. aurifrons*, Mösch.

Leucoma albissima, sp. n.

♂ ♀. Head, antennæ, thorax, abdomen, and legs pure white; frons and palpi yellow. Both wings pure white. Primaries with a black dot at the end of the cell.

Expanse, ♂ 24, ♀ 38 mm.

Hab. N'Dalla Tando, 2700 feet; November (*Ansorge*).

Type in my collection.

Euproctis onii, sp. n.

♀. Head and thorax deep cream; abdomen whitish grey, anal tuft golden brown. Primaries deep cream, with a few scattered dark grey scales below the cell and a very broad band of dark scales occupying all the postmedian and subterminal areas; fringes alternate deep cream and darkish grey. Secondaries uniform creamy white.

Expanse 36 mm.

Hab. Oni (Lagos); May.

Type in the Hope Museum.

Euproctis quadrifascia, sp. n.

♀. Head, thorax, and abdomen chrome-yellow. Primaries chrome-yellow, with four dark bands composed of superimposed dark brown scales; basal band broadish, not extending upwards into the cell; median band broad-angled at lower margin of the cell, but not extending beyond the upper margin; postmedian band broad, waved, interrupted by the veins; subterminal fascia irregular, much narrower, composed of interneural spots, some small and scallop-shaped. Secondaries paler and somewhat lustrous.

Expanse 36 mm.

Hab. Lagos District; November.

Type in the Hope Museum, Oxford.

Euproctis nigrosquamosa, sp. n.

♂. Head, thorax, and abdomen cream-colour. Primaries straw-colour, with a large transverse basal patch of deep straw-colour; median area broadly blackish, the area being

sparingly irrorated with dark scales; terminal area broadly deep straw-colour. Secondaries palest straw-colour.

Expanse 24 mm.

Hab. N'Dalla Tando, 2700 feet; November (*Ansorge*).

Type in my collection.

Euproctis convergens, sp. n.

♂. Head and thorax yellowish; abdomen darker. Primaries lemon-yellow, with the antemedian area and the postmedian area broadly and obliquely covered with dark brown and blackish scales, which converge towards each other and meet in the fold. Secondaries palest lemon-yellow.

Expanse 22 mm.

Hab. Gunnal, West Africa.

Type in my collection.

The female of this species is in the National Collection from Coomassie (*Whiteside*), and agrees with my specimen except that the secondaries are white.

Euproctis citrona, sp. n.

♂. Head and thorax white, with a tinge of very pale lemon-yellow; abdomen white. Primaries the palest straw-yellow, without any markings. Secondaries as the primaries, but whiter.

Expanse 22 mm.

Hab. N'Dalla Tando; January (*Ansorge*).

Type in my collection.

Euproctis n'dalla, sp. n.

♂. Thorax and abdomen creamy white. Both wings white. Primaries with the median area having a few fine black scales, the area being waved in the outline of both margins; a black subapical spot (sometimes absent), with another black spot on the termen just below it, just below vein 5.

Expanse 26 mm.

Hab. N'Dalla Tando, 2700 feet; December (*Ansorge*).

Type in my collection.

Euproctis isis, sp. n.

♀. Head and thorax yellowish; abdomen duller yellow. Primaries clear lemon-yellow, with an obscure trace of a waved paler postmedian line, on the outside edge of which is a short dash on the fold reaching to vein 2 of blackish scales, with a trace of a few basal black scales. Secondaries palest lemon-yellow.

Expanse 36 mm.
Hab. N'Dalla Tando, 2700 feet; November (*Ansorge*).
Type in my collection.

Euproctis nigrolunulata, sp. n.

♂. Head and thorax pale lemon-yellow; abdomen dirty yellow. Primaries very pale lemon-yellow, with an obscure paler curved median line, a similar waved postmedian line, and a trace of a similar subterminal line; a blood-red spot closes the cell; a fine black lunule in the tornus between veins 1 *b* and 2. Secondaries very palest lemon-yellow.
Female precisely like the male.
Expanse, ♂ 26, ♀ 38 mm.
Hab. Gunnal, West Africa.
Type in my collection.

Euproctis fasciata, var. *angolæ*, nov.

♂. Primaries with the median area filled in with crimson and bordered on each side with a line of black scales, no other marks being present.
Hab. N'Dalla Tando, 2700 feet; December (*Ansorge*).
Type in my collection.
There is a fair series of this form, which appears to be quite constant.

Paraproctis, gen. nov.

Primaries broad; costa slightly arched, apex rounded but prominent; termen gradually rounded off into the inner margin, leaving the tornus rounded, not angled. Secondaries smallish. Neuration: primaries with vein 3 from before the angle, 4 from the angle, 5 from above the angle; 6, 7, and 8 stalked, 6 from just beyond the cell, 7 and 8 a third from the apex; 9 and 10 absent; 11 highly arched, close to 12. Cell long. Secondaries with vein 3 from just below the angle, 4 from the angle, 5 from above the angle, 6 and 7 stalked very near the apex, 8 anastomosing with 7 to near the end of the cell.
Type, *Paraproctis osiris*, B-B.

Paraproctis osiris, sp. n.

♀. Head, thorax, and abdomen dirty yellowish. Primaries deep cream, with the wing almost covered with fine fawn-coloured scales, the ground-colour showing through in obscure paler lines; a curved basal line; median line lunulate, postmedian line obscure, waved; a patch of darker fawn scales at the end of the cell, an obscure small similar patch near the tornus. Secondaries cream-colour.

Expanse 29 mm.
Hab. Lokoja District (100 miles north).
Type in my collection.

EUPROCTOIDES, gen. nov.

Palpi porrect, thickly scaled to tip, end-segment short; antennæ of male deeply pectinate with cilia; hind legs with two pairs of long tibial spurs. Neuration: primaries with 3 from below, 4 from the angle, 5 from just above the angle, 6 from below the upper angle, 7 from the end of the areole, 10 anastomosing with 8 to form the areole, but the fork given off beyond the areole; 9 given off from 8 at two-thirds from the areole, 8 depressed strongly, reaching the termen below the apex. Secondaries with 3 and 4 from the angle, 5 from a little above the angle, 6 and 7 stalked near the cell, 8 depressed towards the cell at a fifth from the base, contact very short, then quite free.
Type, *Euproctoides miniata*, B-B.

Euproctoides miniata, sp. n.

Palpi ochraceous, with a dark patch above; head and thorax dull red lead-colour; abdomen pale yellowish brown. Primaries orange-red lead-colour, with broad dark grey spotted lines or bands; a trace of a basal line; antemedian line angled outwards in the cell; some dark grey scales at the end of the cell; postmedian line intercepted by each vein, curved outwards about vein 7; a subterminal row of internervular dark grey spots; fringes red. Secondaries pale reddish orange.
Expanse 34 mm.
Hab. N'Dalla Tando, 2700 feet; November (*Ansorge*).
Type in my collection.

Lacipa subpunctata, sp. n.

♂. Both wings white. Primaries with the median line very broad, yellowish, deeply and acutely angled nearly up to the end of the cell; postmedian line yellowish, very broad and oblique; a black dot below the cell near the base, three black dots beyond the end of the cell; termen finely dotted with black.
Expanse 24 mm.
Hab. N'Dalla Tando, 2700 feet; December (*Ansorge*).
Type in my collection.

PARAXENA, gen. nov.

Palpi fine, end segment curved downwards (sickle-shaped).

Antennæ pectinate, with cilia and fine hairs. Legs, mid and hind with one pair of tibial spurs. Neuration: primaries with vein 3 from before the angle, 4 from the angle, 5 from above the angle, 6 from the upper angle, 7 from the end of the areole, 8 into the apex, 9 excessively short (or obsolete), 10 long from the areole, 11 from the cell; veins 10, 11, and 12 lie almost touching each other. Secondaries with 3 and 4 and 6 and 7 on long stalks from the lower and upper angle respectively, 5 from above the angle, 8 practically free from the base.

Type, *Paraxena esquamata*, B-B.

Paraxena esquamata, sp. n.

♀. Head and thorax dirty white; abdomen pale grey, with anal tuft golden brown. Both wings white, very thinly scaled. Primaries with base sparsely irrorated with fine black scales. Postmedian line composed of two lines of fine black scales slightly waved and oblique.

Expanse 31 mm.

Hab. N'Dalla Tando; January (*Ansorge*). Also Entebbe, Uganda.

Type in my collection.

Paraxena angola, sp. n.

♂. Head and thorax creamy; abdomen whitish. Primaries yellowish cream-colour, with a trace of a double antemedian line angled in the cell; postmedian double line broad, strongly angled beyond the cell; fringes brownish, intersected at the veins; the lines are composed of fine pale brown scales. Secondaries much paler than primaries.

Expanse 24 mm.

Hab. Malange, W. Africa.

Type in my collection.

Orygia albacostata, sp. n.

♂. Head, thorax, and abdomen brownish. Primaries pale brownish, with a patch of darker basal scales; the costa up to the postmedian line and most of the cell greyish white; postmedian dark line fine, double, and angled inwards on the fold; a broad whitish oblique dash from the apex to about vein 5; an obscure subterminal line of fine internervular dashes. Secondaries very pale brownish grey.

Expanse 28 mm.

Hab. Malange, W. Africa.

Type in my collection.

Aroa callima, sp. n.

♀. Head, thorax, and abdomen whitish. Primaries whiter, tinged in parts with pale chestnut cream-colour, especially beyond the cell; a basal costal mark, beyond which is a second larger chestnut-grey patch; a small costal spot near the middle, followed by a darker one a third in front of the apex; a trace of a fine, extremely irregular, white subterminal line projected outwards between veins 3 and 4; above this projection the termen has three snow-white spots, the central being the largest one; apex with a small black spot, behind which is a pure white obscure spot. Secondaries white, tinged with deep cream between veins 2 and 6.

Expanse 36 mm.

Hab. Idakun (Lagos); May.

Type in the Hope Museum.

Aroa perfida, sp. n.

♂. Head and thorax brownish, abdomen grey. Primaries pale brownish, with a darker median area and a darker patch on the termen just above the tornus. Secondaries almost white, with grey fringes.

Expanse 26 mm.

Hab. Gunnal, W. Africa.

Type in my collection.

Aroa catori, sp. n.

♂. Head, thorax, and abdomen brown, the latter with a dark brown, short, dorsal proximal tuft. Primaries darkish brown, with a subbasal dark patch specially marked in the cell and another dark patch at the end of the cell intersected by paler lines; postmedian line finely and sharply crenulate waved, in a broad band of whitish; a small dark patch on the costa and also in the fold adjoining this band; a subterminal row of dark internervular spots, with a short inner row preceding it in the radial area. Secondaries brownish grey.

Expanse 26 mm.

Hab. Lokoja District (100 miles N.).

Type in my collection.

Aroa obliqua, sp. n.

♂. Head and thorax brown; abdomen brownish grey. Primaries dark brown, with an oblique pale fawn-coloured stripe from just before the apex to the middle of the inner margin, increasing in width to the margin; on the outer edge

of this stripe is a dark crenulate fine line; a subterminal row of pale fawn internervular dashes. Secondaries brownish grey.

Expanse 31 mm.

Hab. Lokoja District.

Type in my collection.

Aroa umbrata, sp. n.

♂. Head and thorax brown; abdomen dark grey. Primaries dark umber-brown of a mottled appearance, with a broad band of paler clearer brown in the median area, which is strongly angled outwards beyond the cell, at the outer edge of which is a fine dark crenulate line angled in like manner. Secondaries dark sooty grey. The primaries have a very rough texture, giving the wing a rough and mottled appearance.

Expanse 30 mm.

Hab. N'Dalla Tando, 2700 feet; November.

Type in my collection.

Aroa pinodes, sp. n.

♂. Head, thorax, and abdomen brownish. Primaries dirty brown, basal and median areas darkish brown; a post-median, costal, dirty tawny brown patch, in which is a fine dark toothed line more or less continued down to about vein 4; a similar-coloured apical patch; a preterminal dotted line; termen itself very finely linear and ochreous. Fringes dark brown. Secondaries uniformly neutral grey.

Expanse 25 mm.

Hab. N'Dalla Tando, 2700 feet; November (*Ansorge*).

Type in my collection.

Lœlia infracta, sp. n.

♂. Head, thorax, and abdomen grey. Primaries pale grey, with a narrow dusky curved stripe lengthwise through the cell and between veins 5 and 6 to the subterminal row of black dots, which row is curved and inclined inwards away from the tornus; the whole wing is very finely but sparsely irrorated with slightly darker ash-coloured scales. Secondaries greyish white.

Expanse 25 mm.

Hab. N'Dalla Tando, 2700 feet; November (*Ansorge*).

Type in my collection.

Near *L. fracta*, Schaus.

Lælia flava, sp. n.

♀. Head, thorax, and abdomen yellow, both pale chrome-yellow. Primaries rougher in texture than secondaries, owing to the irroration of very fine yellow scales on a paler ground, with no other markings at all. Secondaries somewhat paler than the primaries.

Expanse 62 mm.

Hab. Oni (Lagos) ; March.

Type in the Hope Museum, Oxford.

Next *L. discolepia*, Hmpsn.

Dasychira strigidentata, sp. n.

♀. Head and thorax pale tawny brown ; abdomen pale ochreous brown. Primaries pale greyish brown, with an antemedian, small, oval, twin red spot in the cell, touching which is a pale double line deeply angulated externally, the interspace between the lines being filled in with brownish ; a large quadrate variegated tawny patch at the end of the cell, palely edged ; the postmedian line double, deeply angulated externally about vein 6, with a sharp internal dentation below vein 2 ; interspace between the double line broadish, brown ; a wedge-shaped tawny patch between veins 3 and 6, in which is an oval bright orange terminal spot between veins 5 and 6 ; two obscure, narrow, ovate subapical spots. Secondaries yellow, with an obscure brownish spot closing the cell and a broad, obscure, brownish terminal border.

Expanse 44 mm.

Hab. Oni (Lagos) ; March.

Type in the Hope Museum, Oxford.

Near *D. brunneicosta*, Holl.

Dasychira ruficosta, sp. n.

♂. Head and thorax dark grey ; abdomen whitish, with a dark proximal tuft. Primaries with the costal half (including the cell) pale chestnut-brown, the lower part grey ; an antemedian oblique pale line, edged laterally with dark brown ; a postmedian, fine, oblique, crenulate dark line, beyond which between veins 1 *a* and 2 is a pale chestnut-brown lunulate patch ; a subterminal line of dark internervular dashes, bordered externally with whitish ; none of the lines extend into the pale chestnut costal half. Secondaries pure creamy white.

Expanse 34 mm.

Hab. N'Dalla Tando (N. Angola), 2700 feet ; November.

Type in my collection.

Near *D. basalis*.

Dasychira obsoletissima, sp. n.

Head and thorax sooty brown; abdomen paler brown. Primaries dark sooty brown, with only a single obscure, oblique, dark grey spotted line in the postmedian area. Secondaries darkish grey.

Expanse 29 mm.

Hab. N'Dalla Tando (N. Angola), 2700 feet; October.

Type in my collection.

Near *D. cæruleifascia*, Holl.

Dasychira inconspicua, sp. n.

♂. Head, thorax, and abdomen brown. Primaries brown, with a slight greyish tinge; the obscure dentate subterminal line, receding somewhat as it approaches the tornus, is the only mark. Secondaries uniform dirty brown.

Expanse 35 mm.

Hab. Gunnal, W. Africa.

Type in my collection.

Dasychira perdita, sp. n.

♂. Head, thorax, and abdomen pale brown. Primaries uniform dirty brown, of a rough texture, and without any marks at all, but with the veins showing darkly through in the radial area. Secondaries pale brown, with the veins showing darkly through.

Expanse 34 mm.

Hab. Gunnal, W. Africa.

Type in my collection.

Dasychira exoleta, sp. n.

♂. Head, thorax, and abdomen mauve-brown. Primaries chocolate-brown, with a deep blackish-brown stripe along the centre of the fold ending a little in front of the termen; this stripe is interrupted by the pale antemedian line and again by a grey mark in the median area; across the median area is a large, greyish, very irregular patch occupying the posterior part of the cell, below which it is suddenly constricted and equally suddenly expands to the inner margin; the postmedian line is represented by a dark double line from the costa to vein 5; a trace of a deep velvety subterminal line is visible which is exceedingly irregular and interrupted and deeply dentate, from which extend two or three fine dashes into the termen. Secondaries uniform greyish brown.

Expanse 40 mm.

Hab. Malange, W. Africa.

Type in my collection.

Allied to *D. gonophora*, Holl.

Dasychira ladburyi, sp. n.

♀. Head ochreous grey; thorax and abdomen greyish; collar greenish. Primaries green, with a dark basal spot below the costa; antemedian line dark, irregular, as to its upper portion dentate and fine, but below the cell broadish and oblique, with a blackish patch in the fold; an obscure spot darkly edged closes the cell, beyond this the obscure postmedian grey line is crenulate and waved; subterminal line excessively irregular, broad and dark, deeply angled several times; a preterminal line of blackish internervular lunules; fringes dark grey, intersected at the veins with paler grey. Secondaries clear ochreous grey.

Expanse 54 mm.

Hab. Bugoma Forest (Uganda Protectorate); July.

Type in my collection.

Allied to *D. gnava*, Swinh.

Dasychira styx, sp. n.

♂. Head and thorax deep velvety brownish black; abdomen somewhat less dark. Primaries deep blackish brown, with lines deep velvety black; basal line distinct, irregular, waved, and dentate; median line scalloped and curved outwards; postmedian line very irregular and deeply waved, followed by another line, somewhat crenulate and waved, but not parallel with the postmedian line; a subterminal row of dots recessed on the fold into the outer postmedian line; termen with dark internervular dashes; the end of the cell is closed by two fine dark lines, the outer one forming part of the postmedian line proper. Secondaries grey, becoming dark brown beyond the cell.

♀. Like the male, but with fawn-coloured edging to some of the lines and spots.

Expanse, ♂ 34, ♀ 40 mm.

Hab. N'Dalla Tando, 2700 feet; November (*Ansorge*).

Types in my collection.

Allied to *D. fusca*, Wlk.

DASYCHIRANA, gen. nov.

Palpi porrect, thickly haired and fringed with longer hairs, end segment of moderate length; antennæ deeply pectinate, pectinations with long cilia. Legs: mid tibiæ with one pair, hind tibiæ with two pairs of long spines; fore leg with a thick tuft of hairs. Wings: primaries of moderate width; costa slightly and evenly arched; termen fairly erect, evenly rounded: secondaries fairly ample. Neuration: primaries with 3 from below the angle, 4 from the angle, 5 from abov the angle, 6 from the upper angle; 7, 8, 9, and 10 stalked,

8 anastomosing with 7 close to the cell to form a very small areole ; 8, 9, and 10 branches given off nearer the apex than the cell. Secondaries with 3 and 4 from the angle, 5 from above the angle, 6 and 7 from the upper angle, 8 joined by a minute bar to 7 near the middle of the cell.

Type *Dasychirana obliqualinea*, B-B.

Dasychirana obliqualinea, sp. n.

♂. Head, thorax, and abdomen brown. Primaries brown, with an obscure basal dark line angled in the cell to the costa but erect below the angle; an oblique dark, straight, post-median line; except for these two lines the wing is practically patternless. Secondaries uniformly brown.

Expanse 38 mm.

Hab. Malange, West Africa.

Type in my collection.

Dasychirana unilineata, sp. n.

♂. Head, thorax, and abdomen brown. Primaries brown, with an indefinite darkening of the ground-colour in and around the cell ; postmedian line pale, waved outwards at its middle and placed somewhat near the termen ; the darkening of the ground-colour extends rather beyond this line. Secondaries glossy brown.

Expanse 34 mm.

Hab. Lokoja District (100 miles north).

Type in my collection.

Dasychirana crenulata, sp. n.

♂. Head, thorax, and abdomen greyish brown. Primaries pale brown, with a dark, curved, interrupted, crenulate basal line ; a dark, outwardly oblique, crenulate median line palely edged externally ; postmedian line dark, palely edged, inwardly waved, crenulate, and inwardly oblique ; a trace of a subterminal spotted line ; termen with a row of cream-coloured dots edged inwardly with dark brown ; fringes pale grey, interrupted with brown. Secondaries pale brownish grey, with an obscure oblique median line.

Expanse 34 mm.

Hab. Lokoja District (100 miles north).

Type in my collection.

LYMANTRIADES, gen. nov.

Palpi depressed, small ; antennæ bipectinate, with cilia, branches long in male, a tuft of depressed hairs given off below the antennæ ; mid tibiæ with one pair of spurs, hind tibiæ with two pairs ; costa straight, depressed at apex,

termen slightly arched, wings expanding rapidly. Neuration: primaries with vein 2 given off a quarter from the lower angle, 3, 4, and 5 from close to the angle, 6 from the upper angle, 7, 8, 9, and 10 stalked, 7 from nearest the cell, 11 from near end of cell. Secondaries with 3 and 4 stalked, 5 from below the middle, 6 and 7 stalked.

Type, *Lymantriades obliqualinea*, B-B.

Lymantriades obliqualinea, sp. n.

♂. Head and thorax dark brownish grey, palpi and antennal tufts bright orange-yellow; abdomen alternately banded yellow and black. Primaries brownish grey with a dark median line palely edged internally, postmedian line very oblique, the area in front of it being paler than rest of wing, a broad dark indefinite area behind it, a subterminal scalloped dark line palely edged internally. Secondaries pale brownish, lightest at the base.

Expanse 28 mm.

Hab. Gunnal, West Africa.

Type in my collection.

PARAPIRGA, gen. nov.

♂. Palpi minute, hairy; face hairy, antennæ of both sexes deeply pectinate, more deeply in male. Neuration with 3 from well before the lower angle, 4 and 5 from the lower angle, 6 from below the upper angle, 7 from 8 and connected by a bar in the middle with 6 and constricted at that point, 8 and 9 forked near the apex, 10 and 11 from the cell, 10 connected with 8 by a short bar beyond 7 and so forming a long areole. Secondaries with 3 from well before the angle, 4 from the angle, 5 from below the middle of the cell, 6 and 7 stalked, 8 free from the base, but connected with the cell by a short bar.

Type, *Parapirga neurabrunnea*, B-B.

Parapirga neurabrunnea, sp. n.

♂. Head and face brownish, thorax grey; abdomen pale grey. Both wings subdiaphanous, but scaled all over with white semitransparent scales. Primaries with all the veins covered with fine brown scales, which also are spread somewhat along the termen. Secondaries with the veins brown only quite close to the termen.

♀. Like the males, but veins less densely brown.

Expanse, ♂ 46, ♀ 59 mm.

Hab. N'Dalla Tando, 2700 feet; November.

Type in my collection.

[To be continued.]

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AND

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LXIV.—*Descriptions of new African Heterocera.*

By G. T. Bethune-Baker, F.L.S., F.Z.S.

[Concluded from p. 552.]

Hypsidæ.

Pseudosoloe, gen. nov.

Palpi hairy, minute, antennæ deeply pectinate in male, less so in female; fore leg with tibial spur the whole length of the joint, hind with two short pairs of tibial spurs. Neuration: primaries, vein 3 from well before the angle, 4 from the angle, 5 from the middle of the cell, 6 from the end of the cell, 7 from the cell, a quarter behind the angle stalked with 8 and 9, 10 and 11 anastomosing from the cell for a quarter, a bar given off from 12 to 11 just beyond its separation from 10. Secondaries with 3 from well before the angle, 4 from the angle, 5 absent, 6 from the upper angle, 7 from the cell well behind the angle, 8 free but approximating to the cell near the base.

Type, *Pseudosoloe n'tebi*, B-B.

Pseudosoloe n'tebi, sp. n.

♂ ♀. Collar pale grey, thorax darker grey. Both wings hyaline grey, with a black spot at the end of the cell in each wing, and the veins very distinct.

Expanse, ♂ 38 mm., ♀ 41 mm.

Hab. Uganda; July.

Types in my collection.

Eupterotidæ.

Phiala nigrovenata, sp. n.

♂. Head yellowish, thorax cream-colour, abdomen yellowish; entire underside of these yellowish. Both wings pale cream-colour, with all the veins outlined strongly with black, but in the secondaries the black lines are much finer and do not extend backwards into the median area. Fringes in both wings yellowish.

Expanse 62 mm.

Hab. Bugoma Forest, Bunyoro; July.

Type in my collection.

Notodontidæ.

Antheua rodeosemena, sp. n.

♂. Head and face bright rose-colour, with a small frontal lozenge-shaped patch of lemon-yellow, and the antennal tufts pale lemon-yellow, below the upper layer of hairs bright rose. Thorax pale lemon-yellow, with central and lateral stripes and spots of bright rose-colour; abdomen with dorsum and sides yellowish tawny, with dark segmental divisions slightly marked, and a lateral black line dividing the ventral pale creamy surface from the upper surface, a row of black dots being below the line. Pectus bright rose-colour; legs with rosy femoral tufts and black tibiæ and tarsi. Primaries very pale lemon-yellow, with two basal costal rose-colour dots, an antemedian row of three rose spots, a postmedian waved row of six spots. Secondaries white, slightly tinged with yellow.

Expanse 48 mm.

Hab. N'Dalla Tando, Angola (*Ansorge*).

Type in my collection.

Antheua delicata, sp. n.

♂. Head and thorax very pale lemon-yellow; abdomen buff-colour. Primaries very pale lemon-yellow, with a very irregular broad longitudinal stripe of pale pink mostly below the cell and extending well into the radial area, at its upper extremity are two isolated pink dots above each other; termen and fringe narrowly pinkish. Secondaries almost pure white, with perhaps the least trace of yellow in the terminal area.

Expanse 30 mm.

Hab. Lokoja District (100 miles to the north).

Type in my collection.

PARAZANA, gen. nov.

Differs from *Zana* in that the cell of both wings is very wide and has a veinlet running right through near the middle, the termen of the wings is not crenulate. The primaries are triangular, rapidly expanding outwards, and broad, costa nearly straight, apex very slightly rounded; termen erect, slightly waved. Secondaries with apex broader than in *Zana* and termen slightly truncated.

Type, *Parazana radiata*, B-B.

Parazana radiata, sp. n.

♀. Head and thorax ashy grey; abdomen yellowish, with grey anal segments. Primaries pale chocolate-brown, brighter than usual in that colour, with the lower margin of the cell narrowly grey, expanding outwards to the termen, the veins showing white; costa narrowly greyish, but with chocolate scales overspreading it, a small grey terminal patch just below the costa, inner margin narrowly slightly greyish. Secondaries clear white just tinged with yellowish.

Expanse 36 mm.

Hab. Lokoja District (100 miles to the north).

Type in my collection.

Corma tephræa, sp. n.

♀. Head and thorax ashy grey; abdomen darker. Primaries ashy grey tinged with lavender, a dark waved basal line, median line dark, irregular, somewhat crenulate; postmedian line dark, waved, almost spotted, with a row of dark points palely edged directly outside it, a pale very irregular subterminal line; termen with dark internervular dashes. Cell closed with an ashy-grey crescent palely edged. Secondaries greyish white, tinged with greyish above vein 7, termen finely dark, fringes pale grey.

Expanse 44 mm.

Hab. Northern Nigeria.

Type in my collection.

EPIDONTA, gen. nov.

Head and frons roughly haired, palpi roughly haired, very small, end segment minute, larger in the female; antennæ fasciculate, in the male with cilia also. Legs: mid with one pair of spurs, hind with two pair. Wings: primaries, costa nearly straight, slightly depressed at apex; termen evenly curved, slightly crenulate; width moderate, expanding

evenly and gradually outwards. Secondaries of moderate dimensions, costa arched near base ; termen slightly truncate, somewhat crenulate. Neuration : primaries with 6, 7, 8, 9, and 10 stalked, 11 from near the middle of the cell ; secondaries with 3 and 4 from the angle, 6 and 7 stalked well beyond the cell, 5 in both wings is weak.

Type, *Epidonta eroki*, B-B.

Epidonta eroki, sp. n.

♂. Head and thorax densely covered with short ash-grey hairs, palpi with similar hairs ; abdomen yellowish. Primaries ash-grey, with a trace of an irregular median double line, beyond which the area is paler, a grey roundish patch at the end of the cell ; a postmedian waved row of dark points on the veins ; a small wedge-shaped dark grey costal subapical patch ; a faint trace of an irregular fine subcrenulate subterminal line, crenulate margin very finely dark. Secondaries creamy white.

♀. Darker grey than the male, all the markings almost obsolescent and with grey secondaries.

Expanse, ♂ 42, ♀ 53.

Hab. Doenyo Erok ; April.

Types in my collection.

Paradiastema nitens, sp. n.

♀. Head and thorax pale greyish brown, antennæ black ; abdomen ochreous grey, anal extremity golden brown. Primaries uniform semidiaphanous lustrous golden grey without any marks at all. Secondaries lustrous greyish white, with a slight trace of yellowish at the apex and along the termen. All the wings are very sparingly covered with scales and are therefore somewhat hyaline.

Expanse 68 mm.

Hab. Lokoja District.

Type in my collection.

Near *P. pulverea*, but the abdomen is not intersected with black and the anal segments are golden brown not white.

Scrancia hollandi, sp. n.

♂. Head whitish, thorax dark reddish, abdomen straw-coloured. Primaries whitish, with the base and upper part of the wing to the end of the cell very dark crimson-brown, which also extends about veins 5 and 6 to the termen and is more or less visible below vein 1. Secondaries shining white.

Expanse 34 mm.

Hab. N'Dalla Tando, Angola, 2700 feet; November (*Ansorge*).

Type in my collection.

Notodontidæ.

EPICERURA, gen. nov.

Palpi short, hairy, porrect; antennæ shortly bipectinate and with cilia; legs hairy. Wings: primaries roughly triangular, broadish; costa straight, apex acutely rounded; termen receding slightly from vein 6. Secondaries small, sharply rounded at apex, receding in a slight curve to the angle. Neuration with vein 5 from above the middle, 6, 7, 8, 9, and 10 stalked, 6 from near the upper angle, 7 and 9 of even length, 8 given off near the apex, 10 from between 6 and 9. Secondaries with 3 and 4 from the lower angle, 5 from the middle, 6 and 7 stalked, 8 depressed suddenly near the base on to 7, lying on it to near the end of the cell, then rising slightly to the apex.

Type, *Epicerura tanda*, B-B.

Epicerura tanda, sp. n.

♂. Head, face, and thorax hairy, darkish grey, abdomen darker grey. Primaries grey, base rather darker up to the basal irregular dark line; postmedian line incurved, slightly scalloped, a dark short costal dash in front of it, subterminal area paler, with a row of dark internervular dashes. The whole wing has a finely dusted appearance. Secondaries shining white.

Expanse 42 mm.

Hab. N'Dalla Tando, Angola; December.

Type in my collection.

Stauropus catori, sp. n.

♀. Head, thorax, and abdomen grizzly. Primaries grizzly grey, with a few black scales and a black spot in the median area, more black scales on the costa at the end of the cell and also in the lower radial subterminal area, and three dark costal subapical dots. The whole surface of the wing has a roughly scaled appearance. Secondaries dark dirty grey.

Expanse 48 mm.

Hab. Lokoja (100 miles to the north).

Type in my collection.

Catarctia subrosea, sp. n.

♂. Head, thorax, and abdomen yellowish, with proximal rosy hairs; abdomen with a dorsal row of black dots on each side; tarsi of legs rosy. Primaries yellowish fawn-colour, with a black basal point, median line very faint, irregular; postmedian line broader, excurved, fairly distinct; apex slightly shaded, as also the termen, the latter with a row of black dots. Secondaries with the basal two-thirds yellowish, the terminal third being bright rosy.

♀. Primaries similar to the male, but duller and with a somewhat diaphanous appearance; the lines are more distinct, the postmedian line being double. The secondaries are nearly all rosy.

Expanse, ♂ 50, ♀ 60 mm.

Hab. Lokoja District (100 miles to the north); January.

Types in my collection.

Trotonotus crenulata, sp. n.

♂. Head, thorax, abdomen, and both wings ochreous grey. Primaries with a trace of an irregular basal line, a postmedian and subterminal line, sharply crenulate and almost parallel, of lavender-grey, beyond the latter a row of similar coloured dots on each vein. Secondaries with the two crenulate lines and the dots, as in the primaries, continued through, but the ground-colour is somewhat paler.

Expanse 58 mm.

Hab. N'Dalla Tando, Angola; November (*Ansorge*).

Type in my collection.

Peratodonta obliqualinea, sp. n.

♂. Head, thorax, and abdomen brown, a deep, dark, velvety-brown, triangular patch on the prothorax. Primaries vinous brown, lavender-brown below the cell; a trace of a fine irregular linear median line, a very oblique twin line from the apex to the inner margin, the interspace filled with pale lavender-brown, beyond this line the area is paler with a trace of an indefinite row of obscure chestnut small patches. Secondaries creamy, with grey hairs on the fold.

Expanse 43 mm.

Hab. Lokoja (100 miles to the north).

Type in my collection.

Near *P. arctipennis*, Holl.

Polienus ochracea, sp. n.

♂. Head, thorax, and abdomen ochreous grey. Primaries

ochreous grey with dark scales below the cell, a dark dash above vein 4 and a dark oblique dash into the apex, a post-median waved row of dark points; cell and costa paler than rest of wing, but with dark fine scales scattered about. Secondaries uniform darker grey.

Expanse 34 mm.

Hab. Malange, W. Africa; December.

Type in my collection.

LEPTOLEPIDA, gen. nov.

Palpi minute, antennæ bipectinate in male. Wings: primaries narrow, costa slightly arched, termen gradually rounded from the apex; secondaries small, somewhat truncate just below the apex. Neuration: primaries, 2 from near the angle, 3 and 4 from the angle, 5 from above the angle, 6, 7, 8, 9, 10 stalked, 6 well away from end of cell, 9 almost obsolete, all these veins lie close to the costa. Secondaries with 3 and 4, and also 6 and 7, stalked; 5 from just below the centre.

Type, *Leptolepida malangæ*, B-B.

Leptolepida malangæ, sp. n.

♂. Head and thorax iron-grey, abdomen yellowish grey. Primaries iron-grey, with a curved basal row of dark dots, and a waved postmedian row of dark points with fine outer edgings of cream, and a short fine blackish dash along the veins from these points; costa slightly darker than rest of the wing; termen with fine brown dots at the end of each vein. In the subterminal area there is an obscure broadish paler grey strongly indented line. The whole wing is but thinly clothed with scales. Secondaries pale grey.

Expanse 29 mm.

Hab. Malange, West Africa.

Type in my collection.

Cleapa afra, sp. n.

♂. Head and thorax chocolate-brown, abdomen dark grey. Primaries dark chocolate-brown up to the subterminal line, beyond which they are much paler; a median zigzag double line of raised scales up to the middle of the cell; subterminal line waved and whitish, the area beyond being greyish in the tornal area and pale chocolate above. Secondaries dirty greyish, getting darker at the apex and near the termen.

Expanse 36 mm.

Hab. Gunnal, West Africa; October.

Type in my collection.

Near *C. latefascia*, Wlk., from India.

Geometridæ.

Boarminæ.

Terina sanguinarea, sp. n.

♂. Head, thorax, and abdomen black; head with a white dot between the antennæ and over each eye; thorax with rows of segmental spots, viz., a dorsal, dorsal lateral, and ventral lateral row. Both wings deep black with blood-red spots. Primaries with two spots in the cell and one at the end of the cell, a basal dash followed by a small spot below the cell, an irregular spot below the angle of vein 2, a small spot between 2 and 3, and another between 3 and 4, these two being nearer the termen. Secondaries with most of the cell broadly red, a spot below vein 2, another between 2 and 3, nearer the termen and between 3 and 4, above this a large quadrate one. Female just like the male, only the red spots are larger.

Expanse, ♂ 40, ♀ 43 mm.

Hab. N'Dalla Tando, 2700 feet; September.

Types in my collection.

Pitthea subflaveola, sp. n.

♂. Head, thorax, and abdomen black, ventral surface of abdomen and face yellowish. Both wings black. Primaries with a small hyaline spot in the cell and two larger hyaline spots below the cell, the lower one being elliptical and much larger than the upper quadrate one. Underside: primaries as the upperside. Secondaries chrome-yellow with a narrow black termen and broader black apex.

Expanse 38 mm.

Hab. Malange, W. Africa; October.

Type in my collection.

Near *P. rubriplaga*, Warr.

Geodena robusta, sp. n.

♀. Head and collar yellow with a central grey stripe, thorax grey, abdomen whitish grey; legs dark grey. Both wings white, with greyish-brown areas. Primaries with costa brown, the outer half (or nearly half) greyish brown, with a small white excavation between veins 2 and 3, a small irregular white patch in this area beyond the cell. Secondaries entirely white except at the apex, which is greyish brown, extending along the termen to vein 4.

Expanse 42 mm.

Hab. Cassualalla, N. Angola (*Ansorge*).

Type in my collection.

Near *G. inferma*, Swinhoe, but the dark areas are different, this being specially marked on the underside.

Geodena leona, sp. n.

Head grey with a yellow spot between the antennæ on the frons; thorax and abdomen pale grey. Primaries white for the basal half; costa entirely dark grey, thus reducing the white area; a slight indentation into the brown area occurs near the angle of vein 2, a longish waved dash beyond the cell, constricted for its lower half. Secondaries entirely white, except the apex to vein 4, and from vein 3 to the angle, which are broadly dark grey.

♀. Like the male, but with the waved dash beyond the cell much larger.

Expanse, ♂ 40, ♀ 44 mm.

Hab. Oni (Lagos).

Types in the Hope Museum.

Near *G. surrendra*, Swinhoe.

Lasiocampidæ.

Taragama pulchristriata, sp. n.

♂. Head rufous, hairs tipped with pale ochreous and grey; antennæ pale tawny; thorax dark rufous, centre of prothorax pale grey; abdomen rufous. Primaries with base and tornal area yellowish, rest of wing pinkish rufous with veins yellowish; from the apex to the middle of the inner margin is a broad curved band composed of three stripes, separated from each other by dark rufous lines, the two outside stripes are pinkish, the middle stripe having a yellowish tawny hue, this band is edged externally with yellowish; termen rufous. Secondaries uniformly rufous.

Expanse 52 mm.

Hab. Oni (Lagos); May.

Type in the Hope Museum.

The larva of this pretty species was found on April 16th; on the 22nd of the same month it began to spin, and the imago appeared on May 8th. The cocoon is a very flimsy structure, evidently made of the hairs of the caterpillar loosely woven together into a fine network, in which the change takes place, but the network is so loose and fine that the pupa can be seen easily in all its parts.

Anadiasa lineadentata, sp. n.

♂. Head and thorax reddish brown, abdomen browner

and paler. Primaries reddish brown, with an oblique dentate dark antemedian line; postmedian dark line strongly curved in the upper radial area, then slightly waved, a subterminal black dentate line, consisting of a series of internervular dentations. Secondaries much paler than primaries.

Expanse 28 mm.

Hab. N'Dalla Tando, 2700 feet (Angola); December (*Ansorge*).

Type in my collection.

Chrysopsyche mirifica, Btl.

One example of this species is in the Hope Museum from Lagos, the larva of which was found on April 7th; this spun its cocoon on April 17th, and the perfect insect emerged on May 1st. The cocoon is spun on the upper side of a leaf and is perfectly elliptical in shape, of a close fine texture, and of a bright sulphur-yellow, the hairs (? of the larva) being so closely and finely woven into the texture as to give it quite a cloth-like surface.

Chrysopsyche albicilia, sp. n.

♂. Frons deep cream-colour, as also are the shafts of the antennæ, with blackish pectinations, closely covered with olive-green hairs on a yellow foundation with a yellowish central patch at the back; abdomen dark grey, with long proximal segments covered with long olive-green hairs and with a yellow anal extremity. Primaries pale yellowish tawny, densely covered with olive-green, fine, hair-like scales for the basal half, and with ordinary dark grey scales for the outer half; an oblique dark antemedian line angled near the costa, a more oblique dark median line similarly angled. Secondaries very dark brownish grey, with white fringes and with basal tufts of long olive-green hairs.

Expanse 40 mm.

Hab. Lagos; May.

Type in the Hope Museum.

The larva of this specimen was found in April, pupation took place on the 22nd of that month, whilst the imago emerged on the 3rd of May. The pupa is enveloped in a fine hairy case, the hairs sufficiently sparse to show the pupa through.

Chrysopsyche ladburyi, sp. n.

♂. Head and thorax pinkish brown, abdomen darker with golden-red anal tuft. Primaries pale pinkish brown, with

fine irregular dark median and postmedian lines, a dark, somewhat spotted, oblique, irregular, waved, subterminal line from close to the apex. Secondaries pinkish grey-brown with the radial area with a golden-yellow lustre and white fringes.

♀. Head, thorax, and primaries ochreous, abdomen darker. Primaries with an irregular antemedian blood-red line, a small red spot at the end of the cell, a postmedian crenulate blood-red postmedian line. Secondaries uniformly golden ochreous.

Expanse, ♂ 36, ♀ 64.

Hab. Bugoma Forest (Lake Albert), Senegal.

Type in my collection.

The male, as usual with this genus, is very different from the female, but my friend Dr. Riel of Lyons, who sent me my first male specimen, tells me that his correspondent in Senegal (M. Gaston) took them *in copulâ* and has reared them from the same batch of eggs. Before receiving Dr. Riel's specimens, I had, however, received the female from my friend the Rev. H. B. Ladbury, from Bunyoro; this is somewhat different from the West African specimen, as it has a considerable irroration of black scales in the basal and postmedian areas, with the trace of an oblique reddish subterminal line from near the apex.

Chrysopsyche jacksoni, sp. n.

♂. Head and thorax tawny straw-colour, abdomen ochreous grey. Primaries pale ochreous grey, with a small basal cream spot, median dark line nearly erect and slightly curved; postmedian line angled from the costa to vein 7, then oblique to middle of inner margin; subterminal line broad, irregular, dentate, silvery grey. Secondaries greyer than primaries, with a cloudy patch at the apex and a trace of a pale line in it.

Expanse 52 mm.

Hab. Entebbe (Uganda); January.

Type in my collection.

Near *C. leucostygma*, Hmpsn.

Chrysopsyche flaveola, sp. n.

♂. Head, thorax, and abdomen pale yellowish. Both wings bright ochreous. Primaries with a small white basal spot below the cell; median line dark, slightly waved; postmedian line angled at vein 7, then obliquely curved to the inner margin; a broad subterminal irregular band of dusky

grey. Secondaries with apex clouded with dark grey, which descends in a line to vein 3.

Expanse 46 mm.

Hab. Gunnal, W. Africa; November.

Type in my collection.

This may be the West African form of the previous species, but the colour is quite different and the basal line is nearer the base and a different shape, whilst the postmedian line is further out and a different shape also.

Glocia tenebra, sp. n.

♂. Head, thorax, and antennæ very dark crimson. Primaries uniform dark crimson, without any mark at all. Secondaries very dark purplish black.

In spite of the dark colour both wings have a certain amount of transparence in their appearance.

Expanse 32 mm.

Hab. Oni (Lagos).

Type in the Hope Museum.

The perfect insect emerged on April 15th from a cocoon found on the 7th of the same month. The cocoon is pear-shaped, with a longish tapering tube at the small end; it has evidently been spun on a sandy soil, being entirely composed of minute particles of white sand for the outer cover; the emergence, however, took place from the side (near the middle), not from the end.

Trabala lambourni, sp. n.

♂. Head and thorax pale green, the latter with a dark central line; abdomen creamy; both wings pale green with olive markings. Primaries with a fine highly curved basal line not reaching to the inner margin, a dark point in the cell, a postmedian oblique slightly arched line, an irregular subterminal row of internervular lunules, a triangular pale brown patch on the inner margin confluent with the postmedian line. Secondaries with a dark point in the cell, an oblique postmedian line and an irregular subterminal row of internervular lunules. Fringes in both wings tipped pale brown. Female like the male, but paler.

Expanse, ♂ 48, ♀ 64 mm.

Hab. Lagos District; November.

Type in the Hope Museum (Oxford).

Metanastria coilotoma, sp. n.

♂. Face, head, thorax, and abdomen pale chocolate-

brown; thorax with deep velvety-brown lateral patches. Primaries reddish brown, with a very deep dark red-brown basal suffusion, extending along the cell and more or less up to the postmedian area, where it ends in a slight curve, there is, however, a paler dull median patch in this area, below the cell this dark area is abruptly terminated by a fine, curved, cream-coloured line, below which the colour is pale reddish to the inner margin; postmedian and terminal areas paler reddish, with a line of irregular internervular short dashes. Secondaries pinkish pale brown.

Expanse 43 mm.

Hab. N'Dalla Tando, 2700 feet; November (*Ansorge*).

Type in my collection.

Metanastria zopheropa, sp. n.

♂. Head, thorax, and primaries dirty umber-brown; abdomen and secondaries darker brown. Primaries with an irregular double dentate antemedian line; postmedian line irregular and partially crenulate, followed by an indistinct trace of a similar line further outwards, from which (line) the posterior area is decidedly paler and in which is the subterminal fine dentate dark line, apical costal area darker. Secondaries quite uniform.

Expanse 60 mm.

Hab. Gunnal, West Africa.

Type in my collection.

Leipaxis crenulata, sp. n.

♂. Head and thorax ochreous tawny brown, abdomen ochreous grey. Primaries tawny brown with a pale median costal patch, median dark line angled outwards in the cell. Postmedian dark line crenulate with two outward angles, subterminal line darkly dotted with pale outer edges subcrenulate, the area between these two lines (postmedian and subterminal) being ochreous tawny. Secondaries creamy buff for the basal two-thirds, pale reddish brown for the terminal third.

Expanse 35 mm.

Hab. N'Dalla Tando, 2700 feet; November (*Ansorge*).

Type in my collection.

Trichiura definita, sp. n.

♂. Head and thorax iron-grey, antennæ ochreous, abdomen grey. Primaries dark grey, with an antemedian white irregular line angled outwards below the cell; postmedian

white line obliquely curved, crenulate, and sometimes angled inwards on the fold, the area between these lines is much darker than elsewhere; a trace of a dark crenulate, subterminal line. Secondaries grey, with a broadish pale postmedian waved band, extending nearly to inner margin near the tornus.

Expanse 27 mm.

Hab. White Nile, below Kosti; February.

Type in the Hope Museum.

This species is near *obsoleta*, Klug, but the colour is quite different and the lines also do not agree with each other.

Chrysoplomidæ.

Chrysoploma ansorgei, sp. n.

♂ ♀. Head, thorax, and abdomen washed-out orange, antennæ black. Both wings greyish ochreous, with all the veins finely outlined with black, and a trace of a broadish darker postmedian line, which in the primaries is obtusely angled about vein 6.

Expanse, ♂ 42, ♀ 46 mm.

Hab. N'Dalla Tando, Angola, 2700 feet; November (*Ansorge*).

Types in my collection.

Chrysoploma microsticta, sp. n.

♂. Head, thorax, and abdomen cream-colour. Both wings very pale washed-out straw-colour, secondaries spotless above. Primaries covered with very pale dove-grey mottlings for the basal two-thirds, the terminal third being nearly clear. On the underside the mottling resolves itself into a sparse irroration in both wings.

Expanse 52 mm.

Hab. Nairobi; February.

Type in my collection.

Chrysectropa, gen. nov.

Palpi thickly scaled, end segment minute; antennæ moderately long, deeply pectinate to tip and with cilia; legs very hairy, hind legs with long tufts. Neuration: primaries with vein 4 from the angle, 3 and 5 from close to the angle, 6 from above the middle of the cell, 7, 8, and 9 stalked, 7 from close to the angle, 8 and 9 on a long stalk, 10 and 11 free from the cell. Secondaries with 3 from before the angle, 4 from

the angle, 5 from the middle of the cell, 6 and 7 from the upper angle, 8 bent down to cell and anastomosing at a point excessively shortly springing up immediately towards the costa and running parallel thereto.

Type, *Chrysectropa unilinea*, B-B.

Chrysectropa unilinea, sp. n.

♂. Head, thorax, and abdomen dirty cream-colour. Both wings pale cream-colour, with a single pale rusty median stripe running through each continuously; the ground-colour has a somewhat shining texture; underside similar to the upper, but all the veins are outlined with pale pinkish brown and there is a small spot of black scales in each cell.

Expanse 28 mm.

Hab. Malange, W. Africa; November.

Type in my collection.

Limacodidæ.

Thosea aurifrons, sp. n.

♂. Face, head, and prothorax golden orange, rest of thorax dark rufous, abdomen dark rufous. Primaries: basal half paler rufous, posterior half purplish brown, the two areas separated by an oblique dark stripe; a waved dark stripe from before the apex to vein 4 on the termen, tornus below this rufous. Secondaries uniform purplish brown.

Expanse 28 mm.

Hab. Malange, W. Africa; October.

Type in my collection.

Thosea lineapunctata, sp. n.

♂. Head, thorax, abdomen, and both wings very pale pinkish brown. Primaries with an oblique median darker stripe, shouldered on the lower margin of the cell, having a white exterior edging; from the costa just in front of the apex there descends to about vein 3 a waved line of small confluent dark spots; apical half of termen darkly clouded, the lower median area and the fold beyond the oblique stripe finely irrorated with rufous, so as to form an indefinite cloud; the basal area also irrorated to a slight extent in like manner.

Expanse 26 mm.

Hab. N'Dalla Tando, 2700 feet; November.

Type in my collection.

Miresa unicolora, sp. n.

♂. Head, thorax, and abdomen pale reddish brown, quite unicolorous, almost like fresh-cut bark, and without any markings. Secondaries paler and with a tinge of ochreous.

♀. Head, thorax, and both wings uniform pale ochreous grey. Primaries with a series of raised scales all over the wing. Secondaries decidedly paler than primaries.

Expanse, ♂ 39, ♀ 48 mm.

Hab. Gunnal, West Africa; June.

Types in my collection.

Near *M. pyrosommoides*, Holl. At first I thought this must be the same species as that described by Holland, of which I have a fair series of quite typical specimens from the same locality; but these two (taken *in copulâ*) have a different look about them, and this led me to examine the neuration, when I found that both, in addition to their uniformly even colour, had the fork of veins 8 and 9 exceptionally short, arising much nearer the cell than in *pyrosommoides*, this character in all the other specimens being quite typical.

Parasa serratilinea, sp. n.

♂. Head, thorax, and abdomen Paris green; palpi and legs grey. Primaries Paris green, with a restricted basal area of grey, its border being erect; a subterminal sharply serrate line from the apex to the tornus, the apical serrations being small, those in the lower radial area larger, the line being projected inwards in this region. Secondaries paler green.

Expanse 36 mm.

Hab. Northern Nigeria.

Type in my collection.

I have described this species as entirely green; my specimen is slightly yellowish at the tornus of the primaries and the secondaries, but I am convinced from the appearance that it is simply a damp stain.

Parasa catori, sp. n.

♂. Head and thorax bright green; antennæ red-brown; abdomen yellow; legs, breast, and ventral surface red-brown. Primaries with the base obliquely pale red-brown, the outer edge being angled twice; central area broadly bright pale green; terminal and subterminal areas broadly pale red-

brown, the inner margin being rounded, indented, and waved. Secondaries yellow, with pale red-brown fringes.

Expanse 28 mm.

Hab. Lokoja (100 miles north).

Type in my collection.

Nearest *P. smaragdina*, B.-B., but basal and terminal reddish areas quite different in shape.

Parasa tripartita, sp. n.

♂. Head and thorax bright olive-green, the latter with a dark grey central stripe; antennæ black; abdomen yellow, with anal segments dark grey; legs and breast dark greyish brown. Primaries darkish grey, the basal area (obliquely rounded on its posterior and lower edges) divided from the outer area by a broad green oblique stripe right across the wing, and extending rather less broadly along the costa to the base. Secondaries yellow for the basal two-thirds, dark grey at apex and termen to vein 2.

Expanse 46 mm.

Hab. Gunnal, West Africa.

Type in my collection.

Near *P. johannis*, Distant, but the stripe of the primaries is different and the secondaries likewise differ.

Macroplectra rosea, sp. n.

♂. Head, thorax, and abdomen buff-colour; sides of face and palpi bright rose-red. Primaries dull buff-colour, with three longitudinal lines of rosy red, the subcostal one the longest, that in the cell rather shorter, and that below the cell shorter still; from the middle line there is a slight trace of rosy radiations along the lower radial veins. Secondaries straw-yellow.

Expanse 22–24 mm.

Hab. N'Dalla Tando, 2700 feet; November (*Ansorge*).

Type in my collection.

This species is superficially like *Natada amica*, but the neuration is different to that genus.

Macroplectra hieraglyphica, sp. n.

♂. Head, thorax, and abdomen tawny brown. Primaries pale tawny brown, with a dark median oblique line curved inwardly on the fold; this line is double up to vein 2, outside this is a large roundish spot of pale chestnut-colour divided by two paler lines and encircled with one also; above this

are two or three small dark spots, the costal area above these and the terminal area being very pale, in which is a subapical bright chestnut half-moon; termen finely chestnut; fringes pale. Secondaries uniform pale pinkish straw-colour.

Expanse 24–26 mm.

Hab. N'Dalla Tando, 2700 feet; November (*Ansorge*).

Type in my collection.

PARAPLECTRA, gen. nov.

Palpi short, hairy, end segment very short, nearly naked; antennæ pectinated. Primaries very broad; termen evenly rounded off, so as to obliterate an angle at the tornus: secondaries small. Neuration: primaries with veins 2 and 3 stalked, 4 from the angle, 5 from near the angle, 6 from above the middle near the angle, 7 and 8 stalked on a longish stalk, 9 absent, 10 from the cell, 11 bent up to touch 12 running along beside it. Secondaries with 3 from near the angle, 4 from the angle, 5 from well above the angle, 6 and 7 stalked, 8 nearly free from base.

Type, *Paraplectra modesta*, B-B.

Paraplectra modesta, sp. n.

♂. Head, thorax, and abdomen pale tawny brown. Primaries buff-colour, with a small pale rusty patch in the basal part of the fold, margined by a short oblique white dash; above this are a few pale rusty indefinite spots, and there are a few dark rough scales scattered very sparingly over the wing. Secondaries uniform pale yellowish straw-colour.

Expanse 21 mm.

Hab. N'Dalla Tando, 2700 feet; November (*Ansorge*).

Type in my collection.

Somara loxotoma, sp. n.

♀. Thorax and abdomen white, the latter tinged with yellow. Both wings pure white; primaries only with a single mark, viz. a broad pale brown stripe along the fold expanding slightly to near the origin of vein 2, then suddenly rising in an oblique broad stripe into the apex.

Expanse 50 mm.

Hab. Lokoja (100 miles north).

Type in my collection.

Nearest *S. nivosa*, Feld.

Somara apiceplagata, sp. n.

♀. Head, thorax, and abdomen pale greyish dove-brown; metathorax with a deep velvety brown patch. Both wings pale greyish dove-brown. Primaries with the least trace of a fine, irregular, dentate grey line, and a similar posterior line which is yet more obscure; a largish, round, apical, brown patch, evanescent on its apical side.

Expanse 44 mm.

Hab. Lokoja (100 miles north).

Type in my collection.

Somara xuthosoma, sp. n.

♀. Head brown, thorax grey, abdomen straw-yellow, legs coffee-brown. Primaries pale brownish, thickly irrorated with fine grey scales; a trace of a short basal line and an oblique, twice waved, dark rusty brown postmedian line, with a white exterior edging. Secondaries pale straw-yellow, with broad internervular dashes of pale fawn-colour.

Expanse 54 mm.

Hab. Lokoja (100 miles north).

Type in my collection.

Altha ansorgei, sp. n.

♂. Head and thorax purplish brown, metathorax carmine, abdomen pale lemon-yellow. Primaries bright canary-yellow, the basal two-thirds being solid reddish purple, with a few overscattered pale lavender scales; this area has a broad outward projection about veins 3 to 5; a dark brown postmedian line is also in the area followed by a canary-yellow spot in the angle of vein 3; subterminal line dark brown, highly curved twice, first from the costa to vein 8, then more prominently from 7 to the tornus; this line consists more or less of confluent lunules. Secondaries very pale sulphur-yellow.

♀. Like the male, but the basal half of the secondaries is yellow.

Expanse, ♂ 34, ♀ 39 mm.

Hab. N'Dalla Tando, N. Angola, 2700 feet; November. Lokoja District.

Type in my collection.

PARAGETOR, gen. nov.

Palpi short, slightly scaled, upturned, not reaching halfway up the eyes. Neuration: primaries with vein 3 from well

before the angle, 4 from the angle, 5 from above the angle, 6 from just above the middle of the cell; 7, 8, 9, and 10 stalked, 8 and 9 very close to the apex; 11 from the cell; 8, 10, and 11 separated widely. Cell with discocellulars nearly erect. Secondaries with 3 from before the angle, 4 from the angle; 5 from just below the middle of the cell, which is very deeply recessed for its upper half, this leaving veins 6 and 7 on a very long stalk; 8 free from the base, not touching the upper margin of the cell.

Near *Hegetor*, Auriv.

Type, *Paragetor concolor*, B-B.

♀. Head, thorax, and abdomen deep straw-colour. Primaries uniform ochraceous, without a trace of any line or mark at all. Secondaries uniformly slightly darker and duller than primaries, also markless.

Expanse 24 mm.

Hab. Gunnal; June.

Type in my collection.

PSEUDOMANTRIA, gen. nov.

Palpi scaled, erect, end segment short; antennæ very slightly serrate, but so slightly as to be almost simple. Wings: costa slightly arched, apex depressed; termen slightly rounded off into the tornus; wings moderately broad. Secondaries smallish, but longer than usual. Neuration: primaries with vein 3 from before the angle, 4 from the angle, 5 from above the angle, 6 from the middle of the cell; 7, 8, and 9 stalked on a long stalk, 10 absent, 11 from the cell free. Secondaries with 3 from near angle, 4 from the angle, 5 from well above the angle, 6 and 7 stalked.

Type, *Pseudomantria flava*, B-B.

Pseudomantria flava, sp. n.

♂. Head, thorax, and abdomen orange-yellow. Primaries uniform chrome-yellow, without any mark at all. Secondaries uniform paler yellow.

Expanse 22 mm.

Hab. Malange, W. Africa; November.

Type in my collection.

TRACHYPTENA, gen. nov.

Palpi short, upturned, scaled. Antennæ serrate. Wings: primaries broad, costa and termen each slightly arched, inner margin produced into a broadish process for two-thirds from

the base. Secondaries fairly ample. Neuration: primaries with 3 from before the angle, 4 from the angle, 5 from near the angle, 6 from the middle of the cell, 7 from the upper angle; 8, 9, and 10 stalked, 11 free from the cell. Secondaries with 4 from the angle, 5 from above the angle, 6 and 7 stalked, 8 anastomosing shortly with the cell, then free.

Type, *Trachyptena rufa*, B-B.

Trachyptena rufa, sp. n.

♀. Head, thorax, and abdomen pale rufous. Both wings quite uniform markless pale tawny, entirely irrorated with fine rust-coloured scales.

Expanse 24 mm.

Hab. Lokoja District (100 miles north).

Type in my collection.

Zygænidæ.

Himantopterinæ.

Petoptila catori, sp. n.

♂. Head, thorax, and abdomen blackish, covered with fine deep orange hairs. Primaries with the basal half of the wings up to the end of the cell yellow, the outer portion being entirely dark sooty grey. Secondaries yellowish for the basal third, the rest being dark sooty grey; the tail is very narrow for two-thirds, then suddenly expands and is spatulate, but equally suddenly narrows into a short, fine, slightly hooked tip.

Expanse 22 mm.

Hab. Lokoja District (100 miles north).

Type in my collection.

Near *P. neuropteridia*, Btl., but the yellow patch is different and the secondaries are quite a different shape.

Doratopteryx zopheropa, sp. n.

♂. Head and thorax dusky grey; abdomen yellowish. Primaries dusky grey, with an obscure yellowish dash in the cell and a small basal patch below the cell. Secondaries with the base yellowish and the long entirely filamentary tail dusky.

Expanse 24 mm.

Hab. Entebbe, Uganda; January.

Type in my collection.

Staphylinochrous whytei latimargo, var. nov.

♀. Head, thorax, and abdomen orange-brown; antennæ black. Both wings dull orange-colour, with the outer area black for a full third.

Expanse 42 mm.

Hab. Lokoja District (100 miles north).

Type in my collection.

Staphylinochrous pygmæa, sp. n.

♂. Head, thorax, and abdomen with yellowish-grey hairs; antennæ black. Primaries black, with the basal half of the cell and the area below it cream-colour. Secondaries cream-colour, with the outer third blackish.

Expanse 30 mm.

Hab. Lokoja District (100 miles north).

Type in my collection.

Next *S. melanoleuca*, Hmpsn.

Staphylinochrous albabasis, sp. n.

♀. Head, antennæ, thorax, and abdomen tawny. Primaries with the basal half of the wings hyaline white, the outer area being sooty grey. Secondaries hyaline greyish white, with the terminal area narrowly dark grey.

Expanse 36 mm.

Hab. Malange; December.

Type in my collection.

ZYGÆNINÆ.

Neurosymploca nigromarginata, sp. n.

♂. Head, thorax, and abdomen black. Primaries dirty ochre-yellow, with a narrow black margin around the entire wing except the basal third of the costa; the margin is broadest along the costa and apex and gradually narrows beyond. Secondaries with the basal two-thirds pink, the outer full third being blackish and the whole of the abdominal fold dusky hyaline.

Expanse 26 mm.

Hab. Malange, W. Africa; December.

Type in my collection.

This is probably a local form of *N. ochreipennis*, Btl., but the whole abdomen of my species is black, there is also a

much narrower black border to the primaries and a smaller pink area in the secondaries.

Saliunca biplagata, sp. n.

♂. Head, thorax, and abdomen bronzy metallic green. Both wings bronzy green. Primaries with a broad stripe below the cell slightly irrorated with fine bronzy scales; at the end of the cell a largish whitish spot, with a narrow oval one below it. Secondaries with a white spot across the end of the cell, the area below the cell at the base being hyaline.

Expanse 37 mm.

Hab. Kamililo, Nandi Country; June.

Type in my collection.

Saliunca kamilila, sp. n.

♂. Frons, head, and collar bright orange-yellow; thorax and abdomen metallic bronzy green. Primaries brownish buff, with the costa darker madder-brown, and with a broad, curved, indefinite, madder-brown band across the end of the cell to the termen about veins 2 to 4. Secondaries purplish grey, somewhat hyaline in the cell and below it.

Expanse 30 mm.

Hab. Kamililo, Nandi Country; June.

Type in my collection.

Byblisia albaproxima, sp. n.

♂. Head black, frons white; thorax and abdomen metallic green, the latter with a white band on proximal segment; anal segment orange-yellow. Both wings steely bluish black. Primaries with a narrow hyaline dash below the cell, followed by three narrow similar dashes (two near the end of cell and one below it); two small hyaline spots between veins 6 and 8, and two similar ones between veins 3 and 5. Secondaries with basal area hyaline, composed of four spots—a large one in the cell, a smaller one below it, and a yet smaller one below it at the extreme base, the fourth being between the first two at the extremity of the second; beyond these is a cluster of three hyaline spots.

Expanse 32 mm.

Hab. Oni (Lagos); April.

Type in the Hope Museum.

Near *B. setipes*, Plötz.

Psychidæ.

Monda cassualallæ, sp. n.

♂. Head, thorax, and abdomen dark grey. Primaries dark grey, area below the cell and vein 2 hyaline white. Secondaries hyaline white.

Expanse 26 mm.

Hab. Cassualalla, N. Angola; August (*Ansorge*).

Type in my collection.

LXV.—*Rhynchotal Notes.*—LV. By W. L. Distant.

Australasian Coreidæ and Berytidæ.

Coreidæ.

Genus Amorbus.

Amorbus, Dall. List Hem. ii. p. 408 (1852).

Type, *A. alternatus*, Dall.

Amorbus damelus, sp. n.

♂. Head, antennæ, pronotum, and corium cinnamomeous; body beneath and legs testaceous; abdomen above black, with two prominent, central, transverse, discal red spots, one each at the anterior margins of the fourth and fifth segments and a very narrow spot at the anterior margin of the sixth segment; connexivum testaceous, with marginal elongate black spots; antennæ moderately robust, joints 1–3 almost subequal in length, remaining joint mutilated in typical specimen; head with a submarginal black fascia on each side; pronotum thickly finely granulose, the lateral margins slightly recurved and more or less shaded with black; scutellum black; corium thickly punctate; membrane bronzy brown; body beneath more or less finely granulose; posterior femora distinctly thickened, somewhat sinuate, inner margin shortly serrate, shortly but more prominently toothed a little before apex; posterior tibiæ very strongly curved, inwardly toothed, the tooth a little nearer base than apex, from tooth to apex the inner margin is shortly serrate.

Long., ♂ 19 mm.

Hab. New South Wales (*Edward Damel*, Brit. Mus.).

Allied to *A. alternatus*, Dall., by the apparently shorter and distinctly much more curved posterior tibiæ, different colour of the abdomen above, &c.

Some difficulty occurs with the species described as *A. planus*, Walk., and which, as I pointed out in 1900 (Ann. & Mag. Nat. Hist. (7) vi. p. 376), is a synonym of *A. alternatus*, Dall. This applies to the female, which he first described; he then added a description of a male specimen, which is another species altogether, and forms the type of the above.

Tambourina, gen. nov.

Head subquadrate, about as long as breadth between eyes; lobes about equal in length, but central lobe slightly prominent and a little apically deflected; ocelli at a short distance from base, almost as near each other as to eyes; antennæ four-jointed, first, second, and fourth joints longest and about subequal in length, third a little shortest; pronotum with the breadth at base less than twice its length, moderately deflected on anterior area, lateral margins sinuate, lateral angles distinctly roundly prominent, a slightly prominent subbasal transverse ridge, the lateral margins at anterior area obsoletely crenulate; scutellum about as broad at base as long; corium subequal in length to head, pronotum, and scutellum together; membrane closely, somewhat reticulately veined; rostrum passing the anterior coxæ, first joint not reaching base of head, third shortest and reaching anterior coxæ; pro- and mesosterna distinctly, centrally, longitudinally sulcate, the sulcation of the latter confined to its anterior area, which is a little angularly produced between the anterior coxæ; abdomen beneath in male with a distinct, central, broad callosity on second segment; anterior and intermediate femora with a distinct spine beneath near apex, posterior femora somewhat strongly incrassated, spined beneath on apical third, shortly sparingly tuberculate near upper surface; posterior tibiæ distinctly dilated on each side, roundly above, angularly beneath, the dilatation gradually increasing from base and terminating a little beyond middle; posterior tarsi three-jointed, basal joint shortest.

Allied to *Amorbus*, from which it differs by the relatively shorter and broader pronotum, the posterior tibiæ dilated on each side, &c.

Tambourina kelsalli, sp. n.

♂. Brownish ochraceous, abdomen above and beneath

testaceous; antennæ pale castaneous, the apical joint ochraceous; head above and anterior area of pronotum moderately palely pilose; pronotum and scutellum finely granulose; corium thickly finely punctate; membrane subhyaline; abdomen above testaceous, connexivum with dark castaneous spots, becoming obsolete on basal area, and the inner abdominal lateral margins with black marks, becoming obsolete on apical half; sternum more darkly granulose and punctate; abdomen beneath with two central longitudinal series of black punctures, the spiracles and an inner segmental series of small spots black, anal segment castaneous; legs ochraceous, femora above pale castaneous, posterior tibiæ and tarsi pale ochraceous, the base and dilated area black; structural characters as in generic diagnosis.

Long., ♂ 17 mm.

Hab. S. Queensland; Tambourine Mts. (*Kelsall*, Brit. Mus.).

Kurnaina, gen. nov.

♂. Body subelongate; head slightly longer than broad, subquadrate, not produced beyond the antenniferous tubercles, lateral lobes scarcely longer than the central lobe, but distinctly divided at their apices; ocelli at base behind eyes, about as wide apart as from lateral margins; eyes slightly longer than broad, adpressed on sides of head, situate at about one-third from base; antennæ with the basal joint moderately incrassate, about as long as head, second and third longest, fourth shorter than third, stouter and pyriform; pronotum about as long as broad between the lateral angles, lateral margins straightly oblique, anterior margin truncate, posterior margin depressed, subconvex, lateral angles subprominent; scutellum small, apparently triangular, but imperfectly seen in the coarsely pinned type; corium about as long as head, pronotum, and scutellum together; membrane not quite reaching apex of abdomen, veins numerous and somewhat reticulate; connexivum exposed from about middle of corium, distinctly upwardly reflexed; rostrum reaching the intermediate coxæ, first joint reaching base of head, second extending to anterior coxæ, third and fourth short, subequal in length; mesosternum distinctly centrally sulcate; abdomen beneath moderately convex, narrowed beyond middle to apex, the lateral margins laminately depressed; anterior femora obscurely bidentate at apices, all the femora equally stout, posterior femora not more incrassated.

Allied to *Gelonus*, Stål, but differing by the non-apically spined intermediate and posterior femora, different structure of the pronotum, &c.

Kurnaina tridens, sp. n.

Brownish ochraceous; pronotum, connexivum, and body beneath paler in hue; membrane shining fuscous brown; antennæ brownish ochraceous, basal joint fuscous brown, apical joint piceous, second joint slightly longer than third; head and pronotum finely granulose, the latter with an indistinct central longitudinal impression and a similarly indistinct transverse impression about one-third from apex, lateral margins very obscurely crenulate: corium thickly coarsely punctate, a distinct longitudinal series of close punctures at lateral margins; body beneath closely punctate, more coarsely on sternum than on abdomen, the latter with obscure darker irregular spots on lateral margins; legs and rostrum brownish ochraceous, the latter with its apex black.

Long., ♂ 12 mm.

Hab. Centr. Australia; Hermannsburg (*H. J. Hillier*, Brit. Mus.).

Turrana, gen. nov.

Body long, narrow and elongate; head slightly longer than broad, not produced beyond the antenniferous tubercles, but centrally deeply incised between them: eyes small, round, situate on lateral margins of head about midway between base and insertion of antennæ; antennæ robust, first joint stoutest, narrowing towards apex, subequal in length to third, second shorter than either first or third, fourth shortest and pyriform; pronotum distinctly longer than broad, the lateral margins almost straightly oblique, but distinctly moderately ampliately reflexed, anterior angles subprominent, anterior margin subtruncate, posterior margin with two distinct central impressions; scutellum small, with a distinct central ridge; corium subequal in length to head, pronotum, and scutellum together, its apical margin longer than claval suture, but only very slightly longer than outer claval margin, lateral margin slightly convex and narrowing inwardly beyond middle to apex; membrane only slightly passing the base of the penultimate abdominal segment, the venation reticulate; rostrum not passing the anterior coxæ, second joint shorter than third and fourth together; mesonotum anteriorly and posteriorly centrally sulcated; legs short, femora moderately evenly thickened, thickly

finely tuberculate, tibiæ finely and obscurely granulose; abdomen beneath somewhat thickly longitudinally ridged and centrally finely linearly sulcate.

Allied to *Pomponatius*, Dist.; differing by the deeply incised head between the antenniferous tubercles, different comparative lengths of the antennal joints, rostrum not passing the anterior coxæ, the more elongate body and shorter hemelytra, &c.

Turrana abnormis, sp. n.

Head, pronotum, scutellum, and corium brownish ochraceous; membrane pale castaneous; antennæ black above, shortly greyishly pilose; body beneath greyish ochraceous; legs black or blackish, tibiæ (excluding apices) dull ochraceous; head finely and obscurely punctate and pilose; pronotum with the posterior two-thirds sparsely coarsely punctate, with a central pale levigate line, the anterior area finely irregularly granulose; scutellum with a fine central longitudinal ridge, on each side of which the colour is piceous; corium irregularly punctate, some of the punctures profound; abdomen above testaceous, with a central pale longitudinal line, connexivum black, spotted with ochraceous; other structural characters as in generic diagnosis.

Long. 13 mm.

Hab. Queensland; Townsville (*Dodd*, Brit. Mus.).

Genus Pendulinus.

Pendulinus, Thunb. (part.), Hemipt. rostr. Cap. iv. p. 5 (1822).

Type, *P. hasticornis*, Thunb.

Pendulinus fuscescens, sp. n.

Brownish ochraceous; extreme lateral margins of pronotum black; extreme lateral margins and apex of scutellum stramineous; lateral margins of corium narrowly pale ochraceous; membrane pale bronzy, subhyaline; body beneath and legs pale testaceous; antennæ with the first, second, and third joints testaceous, their extreme apices black, fourth joint greyish brown, broadly palely annulated near base, first joint a little stoutest and moderately curved; first and third and second and fourth joints subequal in length; head with the central lobe broadly prominent before the antenniferous tubercles; pronotum coarsely darkly punctate and moderately wrinkled, an obscure and somewhat interrupted central pale levigate line, lateral angles

subacutely produced, their apices a little directed backward; scutellum coarsely darkly punctate; corium (excluding lateral margins) thickly finely punctate; membrane not passing abdominal apex; bucculæ short, not reaching eyes; rostrum slightly passing the intermediate coxæ; mesosternum sulcate; head beneath and sternum coarsely punctate.

Long. 14 mm.

Hab. Queensland; Mackay (*Rowland Turner*, Brit. Mus.).

This and the following species are the first of the genus *Pendulinus* yet recorded from Australia.

Pendulinus lutescens, sp. n.

Pale shining ochraceous; posterior margin of pronotum, scutellum, and corium pale testaceous, the latter with the lateral margin pale ochraceous; membrane shining bronzy brown; connexivum, body beneath, and legs pale ochraceous; antennæ ochraceous, the fourth joint with its apical half fuscous, first joint a little stoutest and curved, first and third and second and fourth joints subequal in length; head with the central lobe distinctly produced before the antenniferous tubercles; pronotum somewhat thickly wrinkled and punctate, the lateral angles somewhat distinctly and subacutely produced; scutellum punctate, with its extreme apex black; corium (excluding lateral margins) thickly finely punctate; membrane not passing the abdominal apex; bucculæ short, not reaching eyes; rostrum about reaching posterior coxæ; mesosternum moderately sulcate; sternum thickly coarsely punctate.

Long. 14 mm.

Hab. Queensland; Mackay (*Rowland Turner*, Brit. Mus.).

Jalina, gen. nov.

Narrow, elongate; head large and broad, about as long as breadth between eyes, only slightly produced beyond the antenniferous tubercles, the apex of the central lobe a little prominent, the lateral margins distinctly sinuate; eyes large and prominent, distinctly exserted beyond the anterior angles of the pronotum; ocelli between eyes at a short distance from base, about as far apart from each other as from eyes; antennæ moderately long and slender, first, second, and third joints subequal in length, first stouter than second or third, fourth short and moderately incrassated; pronotum slightly longer than broad at base, the lateral margins oblique but rounded and obscurely crenulate near apices, anterior margin truncate; lateral angles slightly

spinously prominent, and between them the basal marginal area is deflected posteriorly; scutellum longer than broad, its lateral margins straightly oblique and its apex subacute; corium about as long as head, pronotum, and scutellum together, the apical angle acute; membrane not quite reaching the abdominal apex, with several transverse basal cells, the remaining venation longitudinal, more or less furcate; connexivum in ♂ exposed from behind middle of corium, in ♀ scarcely visible, the lateral angles of the last two segments moderately dentately prominent; bucculæ very short; rostrum reaching the posterior coxæ, first joint slightly passing base of head, second nearly reaching middle of mesosternum, third reaching the intermediate coxæ; spiracles placed before the middle of the abdominal segments; tibiæ obscurely sulcate; apex of sixth abdominal segment in ♂ dorsally truncate.

This genus is located in the division Pendulinaria.

Jalina ocularis, sp. n.

Ochraceous; more or less marked and punctured with black; head ochraceous, with two longitudinal piceous lines transversely connected in front; eyes castaneous brown; antennæ brownish ochraceous, first joint speckled with black, second with a central pale annulation beyond middle, its extreme apex black, third with a more obscure subapical annulation, its extreme apex also black, fourth with nearly apical half black; pronotum thickly coarsely punctate, the anterior lateral margins, two broken, irregular, central, longitudinal fasciæ, some lunulate markings on the anterior area, and the lateral angles black; scutellum somewhat coarsely punctate, the apex ivory-white; corium coarsely blackly punctate; membrane shining cupreous; connexivum, as visible in ♂, ochraceous, with black spots; body beneath and legs pale ochraceous, the latter somewhat thickly mottled with piceous or black; two small black spots on each side of pro-, meso-, and metasterna, a sublateral series of black segmental spots to abdomen; sternum thickly coarsely punctate; other structural characters as in generic diagnosis.

Long., ♂ ♀ 12 mm.

Hab. Queensland (*F. P. Dodd*, Brit. Mus.).

Piramurana, gen. nov.

Allied to the preceding genus *Jalina*, but differing in the following characters:—

Head broad, but much shorter than breadth between the

exserted eyes, which are strongly pedunculate; it is also much more considerably produced beyond the antenniferous tubercles, with the apices of the lateral lobes oblique and somewhat outwardly angularly broadened; ocelli much nearer to each other than to the exserted eyes; pronotum as long but not longer than broad at base; lateral angles of the last two abdominal segments not dentately prominent; rostrum reaching the intermediate coxæ, first joint passing base of head, second nearly reaching middle of mesosternum, third and fourth short.

Piramurana cyclops, sp. n.

♀. Head ochraceous, the eyes castaneous; antennæ ochraceous, first and third joints subequal in length, second longest, remainder mutilated in typical specimens; pronotum ochraceous, coarsely brownly punctate, the anterior marginal area, a central longitudinal line, and narrow basal margin pale ochraceous and impunctate, on the anterior marginal area is a small, central, curved, linear black spot, and also a linear black or blackish spot near each anterior angle, lateral angles moderately angularly prominent, a little directed backward, blackish, as is also the basal submargin, a distinct narrow anterior collar containing a transverse row of punctures, the lateral margins a little rounded at the anterior area and obscurely crenulate; scutellum longer than broad, somewhat sparsely and irregularly brownly punctate, its apex greyish white; corium ochraceous, thickly, coarsely, brownly punctate; membrane bronzy brown, the veins numerous and longitudinal, some furcate; connexivum exposed from near apex of corium, ochraceous, spotted with castaneous; body beneath, rostrum, and legs pale ochraceous, apices of the posterior femora and posterior tibiæ castaneous; sternum very coarsely punctate; abdomen sparsely and more finely punctate on the sublateral areas.

Long., ♀ 16 mm.; exp. between outer margins of eyes 4 mm.

Hab. Queensland (*F. P. Dodd*, Brit. Mus.).

Genus Cletomorpha.

Cletomorpha, Mayr. Reise Nov. Hem. p. 118 (1866).

Type, *C. bellula*, Stål.

Cletomorpha mackayensis, sp. n.

♂. Head pale ochraceous, slightly granulose, a distinct

acute spine on each side before the antenniferous tubercles; antennæ pale ochraceous, first joint gradually thickened, longer than head, second slightly longer than third, fourth short, infuscate, thickened, pyriform; pronotum thickly punctate, pale ochraceous, the basal area from between the lateral angles castaneous brown, lateral angles with their apices acute, blackish; scutellum pale ochraceous, sparsely punctate, a subapical and two irregular central spots castaneous brown, the apex greyish white; corium ochraceous, thickly brownly punctate, a transverse greyish-white fascia a little before apex; membrane subhyaline; connexivum ochraceous, with irregular castaneous spots, one before middle largest and occupying the whole margin of the segment; body beneath, legs, and rostrum pale ochraceous; sternum coarsely punctate, apices of the lateral angles of the prosternum and apex of the rostrum black; abdomen beneath with four broad longitudinal series of blackish punctures, a small black marginal spot at the apices of most of the segmental incisures, the lateral segmental angles acutely produced, a blackish spot on each side of the apex of the anal segment.

Long., ♂ $7\frac{1}{2}$ mm.

Hab. Queensland; Mackay (*Rowland Turner*, Brit. Mus.).

A species distinct from some Oriental species, which it more or less resembles in colour and pattern, by the very distinct acute spine on each side before the antenniferous tubercles.

Genus Clavigralla.

Clavigralla, Spin. Ess. p. 200 (1837).

Type, *C. gibbosa*, Spin.

Clavigralla horrens.

Clavigralla horrens, Dohrn, Stett. ent. Zeit. xxi. p. 403 (1860).
Cletus? indecorus, Walk. Cat. Het. iv. p. 197 (1871).

Hab. Queensland; Mackay (*Rowland Turner*, Brit. Mus.).

This species had already been recorded from Ceylon, Java, Philippines, Flores, and New Guinea.

Genus Melanacanthus.

Melanacanthus, Stål, En. Hem. iii. p. 92 (1873).

Type, *M. ferrugineus*, Stål.

Melanacanthus margineguttatus, sp. n.

Head and pronotum castaneous brown; lateral margins and two central longitudinal fasciæ to head and pronotum black, basal margin of the latter mostly black, with a central longitudinal ochraceous spot; scutellum black, centrally castaneous brown, its apex pale stramineous; corium black, the lateral margin greyish white, widened on apical area; membrane hyaline, except at margins, reflecting the brown abdomen beneath; body beneath black, greyishly pilose; a greyish longitudinal fascia on each side of head and prosternum; abdomen beneath with a central longitudinal line, sometimes the whole central discal area, and the lateral margins ochraceous; abdomen above black, with a few very obscure central, segmental, castaneous spots, the connexivum ochraceous, with prominent black spots; legs black or blackish, the tibiæ (excluding bases and apices) dull ochraceous, basal joints of tarsi more or less ochraceous; antennæ brownish ochraceous, first joint distinctly passing apex of head, first and second subequal in length, third a little longer, fourth longest; head and pronotum finely obscurely pilose; pronotum finely punctate, more strongly so and wrinkled on the basal area, lateral angles subprominent, black, and a little directed backwardly; corium (excluding the pale lateral margin) thickly coarsely punctate; membrane passing the abdominal apex; posterior femora somewhat longly spined.

Long. 11 mm.

Hab. North Australia; Alexandria (*W. Stalker*, Brit. Mus.).

Differs from *M. scutellaris*, Walk., by the prominently spotted connexivum, differently coloured markings throughout, posterior area of the pronotum more distinctly raised and wrinkled, &c.

Berytidæ.

Genus Metatropis.

Metatropis, Fieb. Wien. ent. Monats. 1859, p. 206.

Type, *M. rufescens*, Herr.-Schäff.

Metatropis tipularius, sp. n.

Dark ochraceous; head and anterior area of pronotum a little paler; apex of abdomen above and spots to connexivum castaneous; body beneath pale castaneous; head beneath

and prosternum ochraceous ; abdomen beneath with a central and marginal series of pale ochraceous spots ; antennæ ochraceous, first joint very long, moderately clavate and castaneous at apex, second and fourth subequal in length, each distinctly shorter than third, extreme apices of second and third black, fourth black or piceous, annulated with pale ochraceous near base ; pronotum (excluding apical area) thickly coarsely granulose, with a somewhat obscure central longitudinal ridge, the posterior angles moderately laminately lobate ; scutellum distinctly, centrally, longitudinally ridged, the apex acute ; membrane shining bronzy, not reaching the abdominal apex ; legs ochraceous, apices of the femora distinctly clavate and castaneous, tarsi with the basal joint pale ochraceous, remainder piceous.

Long. 8 mm.

Hab. N. Australia ; Port Darwin (*J. J. Walker*, Brit. Mus.).

This species was taken during the voyage of H.M.S. 'Penguin.'

LXVI.—*Notes from the Entomological Department of the London School of Tropical Medicine.*—No. II. *Description of a new Species of* Simulium *from the Siamese Hills.* By Miss Sophia L. M. Summers, M.A., B.Sc.

Simulium nigrogilvum, sp. n.

Numerous specimens of this fly were sent, very kindly, to the London School of Tropical Medicine by Dr. Kerr, of Chiengmai. They were collected by Mr. H. B. G. Garrett, of the Siamese Forest Department, on the hills of Siam east of the Menam, during the months of September and October.

In view of Dr. Sambon's theory, that *Simulium* plays an important part in the spreading of pellagra, every reference to this genus is of interest. Only two species of the genus as yet have been described from the Oriental Region, namely *Simulium indicum*, Becher, from the Himalayas (Journ. Asiat. Soc. Bengal, liii. pt. 2 (1884) p. 199, pl. xiv.), and *Simulium nobile*, Meijere, from Java (Tijdschrift voor Ent. Deel l. (1907) p. 206).

The new form, *Simulium nigrogilvum*, is a very striking species. Its colouring is most vivid, almost wasp-like in its contrasts. It is large, its length being almost 3·5 mm. Its head and thorax are velvety black, with bright golden hairs.

The antennæ are brown, yellowish white at the base. In spirit the abdomen is white, with brown bands posteriorly. The legs are banded black and white; the tarsi of the front pair are much stronger than those of the other pairs. The wings are hyaline.

Head velvety black, with golden hairs between and behind the eyes; the face also is black. *Antennæ* dark brown, except the first two segments and a part of the third, which are yellowish white. *Palps* brown, with the exception of the second segment, which is black.

Thorax velvety black; the scutum is covered more or less with bright golden hairs.

Wings hyaline, with only the first and third longitudinal veins distinct and dark. *Halteres* yellowish white.

Legs.—Femora and tibiæ are white at the proximal end, dark brown at the distal end. All the tarsal segments of the first pair of legs are dark brown, but in the second and third pairs the metatarsus is yellowish white in the proximal half, and the next tarsal segment has a white spot at the base. The penultimate tarsal segment is heart-shaped in all the legs.

Abdomen.—In spirit-specimens the first two segments are white; the third, fourth, and fifth are white, each with a dark brown dorsal cross-band; the last two are entirely brown, darker dorsally than ventrally.

The mouth-parts seem to be similar to those of other species. The second segment of the maxillary palps has a curious little, probably sensory, vesicle, with a minute circular opening on the side of the segment.

Simulium nigrogilvum is about the same size as *Simulium indicum*, but it differs from that species in the following points:—(1) The base of the antenna is yellowish white, whereas in *S. indicum* the antennæ are entirely dark; (2) the femora and tibiæ are half white, half black, but in *S. indicum* they are said to be black-brown; (3) the first two segments of the abdomen are white, and ventrally all the rest of the abdomen except the tip is white also; whereas in *S. indicum* only the first segment and the sternal parts of the next three segments are yellowish white.

Simulium nigrogilvum is much larger than *Simulium nobile*, which measures only 1·5 mm. The other points of difference between the two species are as follows:—(1) The antennæ of *S. nobile* are reddish yellow, with black tip; (2) the thorax of *S. nobile* is said to be almost naked, with a silver-white sheen, only a posterior strongly arched cross-band being velvety black, whereas in *S. nigrogilvum* the scutum is

covered with bright golden hairs. In *S. nobile* the legs are described as blackish brown, the hind tibiæ as shiny mother-of-pearl, the basal moiety of the first two tarsal segments of the same leg as yellow ; but in *S. nigrogilvum* the legs are banded black and white. The halteres are reddish yellow in *S. nobile*, but in the new species they are white. The abdomen of *S. nobile* is silky black, instead of being, as in *S. nigrogilvum*, largely yellowish white.

The type of the new species has been presented to the British Museum. Unfortunately, having been dried after being in spirit, its colouring is affected.

I wish to take this opportunity of thanking Lt.-Col. Alcock, I.M.S., F.R.S., C.I.E., &c, for his constant help and advice, which are invaluable.

LXVII.—*Some Barnacles of the Genus* Scalpellum *from Irish Seas.*

By N. Annandale, D.Sc., Indian Museum, Calcutta.

Through the kind offices of Mr. S. W. Kemp I have been entrusted with the examination of certain barnacles of the genus *Scalpellum* taken in Irish seas by the Fisheries Branch of the Irish Department of Agriculture. These barnacles fall into three distinct species, namely *Scalpellum vulgare*, Leach (= *Lepas scalpellum*, Linné), *Scalpellum velutinum*, Hoek, and *Scalpellum* (*Smilium*) *kempi*, sp. n.

Scalpellum vulgare is by far the commonest species of its genus in the seas of Northern Europe and in the Mediterranean, but has not been taken on the coasts of America or in the S. Atlantic. Its bathymetrical range extends from about 20 to about 200 fathoms. There are a considerable number of specimens in the collection before me from the following stations :—

		fms.
S. 36....	10 miles off Clogher Head, Co. Louth * ..	20–22
R. 9	17½ miles S.W. ½ W. of Coningbeg Light .	40
R. 29 ..	15 miles S.E. of Mine Head	40–42
S. R. 211.	70 miles S.W. of Fastnet	81
S. R. 147.	Porcupine Bank	91½
S. R. 360.	52° 4′ N., 11° 27′ W.	108–120
S. R. 97 .	*ca.* 75 miles S.W. by W. ½ W. of Fastnet .	199

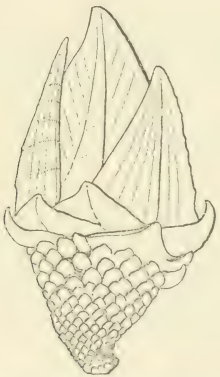
* [Although only one specimen was sent to Dr. Annandale, in the course of trawling surveys in the western part of the Irish Sea *S. vulgare* has been frequently taken, at depths below 20 fathoms, usually attached to stems of *Aglaophenia*.—G. P. Farran.]

S. velutinum, which is closely related to *S. formæ*, Alessandri, of the Italian Miocene *, is common on both sides of the Atlantic in northern latitudes, and has been taken as far south as Tristan d'Acunha. It also occurs in the Indian Ocean. The bathymetric range is extraordinary—from 35 to over 1000 fathoms. The Irish collection includes five specimens (the largest with a capitular length of 27 mm.) from S. R. 363, 51° 22′ N., 12° 0′ W., 695–720 fathoms.

The new species appears to be most nearly related to *Scalpellum gemma*, Aurivillius, and *Scalpellum grimaldi* of the same author, but possesses two extra valves below the rostrum and a narrower carina. *S. gemma* was described from Greenland and *S. grimaldi* from the Azores.

Scalpellum (*Smilium*) *kempi*, sp. n.

Capitulum large, triangular, moderately compressed, bearing 15 stout white valves, which are more or less imbricate and project at the tips. Carina straight, narrowly triangular



Scalpellum (*Smilium*) *kempi*, sp. n. × 3.

in lateral view, bluntly keeled posteriorly, bearing about six transverse ridges and distinctly striated vertically. Terga vertical, triangular, large, occupying more than half the capitular area, slightly retroverted at the tip, having a distinct vertical keel along the middle line. Scuta resembling

* See Pilsbry, Bull. U.S. Nat. Mus. no. 60, p. 26 (1907).

the terga in shape, but only three-fourths as long; their tips turned outwards and projecting laterally, their inner margin overlapping the occludent margin of the terga for a considerable distance. Rostrum prominent, triangular, recurved. The two subrostals similar in shape, but smaller and much less prominent; the lower valve larger and more prominent than the upper. Latera transverse, triangular, of no great size, prominent at the tips. Subcarina resembling the rostrum, but less than half as long.

Peduncle much shorter than the capitulum, compressed, almost triangular in lateral view, covered with almost nodular subimbricate plates arranged somewhat irregularly.

Cirri very long and slender, feebly curved, colourless.

Dimensions.—

	mm.
Length of capitulum	12
Breadth „	12
Length of peduncle.....	8
Breadth „	9

Locality.—S. R. 504, 12. ix. 07, 50° 42′ N., 11° 18′ W., 627–728 fathoms; on *Lophohelia*.

The external characters of this barnacle are so peculiar that I have ventured to describe it without dissecting the unique specimen, on which I have not succeeded in finding any degenerate males. I understand that this specimen will be deposited in the British Museum.

LXVIII.—*Three new African Rodents.*

By Oldfield Thomas.

(Published by permission of the Trustees of the British Museum.)

Epimys stella, sp. n.

Like *E. alleni*, but skull markedly longer.

External appearance as in the Fernando Po *E. alleni*, of which this would appear to be the mainland representative. General colour above dull rufous fawn, as in *E. alleni*. Belly greyish, the bases of the hairs slaty, their tips greyish white. Hands and feet dull whitish. Tail long, very finely haired, so as to appear naked. Mammæ 2—2=8.

Skull decidedly larger than that of *E. alleni*, the brain-case much longer, but not, as is the case in the next species, much broader. Supraorbital edges square, but without beading. Palatal foramina longer than in *E. alleni*, and bullæ larger.

Dimensions of the type (measured as a spirit-specimen before skinning) :—

Head and body 77 mm. ; tail 140 ; hind foot 17·5 ; ear 15.

Skull : greatest length 24·8 ; condylo-incisive length 23·4 ; zygomatic breadth 12·3 ; nasals 8·2 ; interorbital breadth 4·3 ; breadth of brain-case 11·2 ; palatilar length 10·6 ; palatal foramina 5·1 ; upper molar series 4.

Hab. Congo and Cameroons. Type from the Ituri Forest between Mawambi and Avakubi, Eastern Congo. Others from Efulen and Ja River, Cameroons.

Type. Adult female. B.M. no. 7. 1. 2. 23. Collected in 1906 by R. B. Woosnam, and presented by the Subscribers to the Ruwenzori Expedition.

Compared with the true *E. alleni* of Fernando Po (of which the Fernando Po Expedition of 1904 obtained an adult topotype clearly identical with the young type of the species) this mainland form is markedly larger, with a longer brain-case, and has not the disproportionally short muzzle of that form. From *E. carillus* it differs by having 8 instead of 6 mammæ.

Epimys æta, sp. n.

General appearance of *E. alleni*. Brain-case very large and broad.

Proportions as in *E. alleni*. Colour above rather more buffy than "wood-brown" ; sides clearer buffy, forming a buffy line along the edge of the abdominal colour, which is well-defined white, the bases of the hairs pale slaty. Ears rather smaller than in *alleni*, grey-brown. Hands whitish ; feet with whitish edges and digits, middle line of metatarsus darker. Tail uniformly brown.

Skull with a very large brain-case, shaped somewhat like that of a *Nyctomys* ; the interorbital region broad, with well-defined supraorbital beads, which extend backwards half across the parietals. Muzzle small and slender. Anteorbital plate very slightly projected forward, though more so than in *alleni*. Palatal foramina longer and bullæ larger than in *alleni*. Molars narrow, of the rather *Uromys*-like shape found in this group of mice ; inner cusp of second lamina of m^1 and m^2 elongated antero-posteriorly.

Dimensions of the type (measured in flesh) :—

Head and body 85 mm.; tail 102 ; hind foot 17; ear 14.

Skull : greatest length 24·1 ; condylo-incisive length 21·7 ; nasals 7·7 ; interorbital breadth 4·6 ; breadth of brain-case 11·6 ; palatilar length 10·6 ; diastema 7 ; palatal foramina 5·1 ; upper molar series 4·5.

Hab. Bitye, Ja River, S.E. Cameroons.

Type. Adult female. B.M. no. 11. 5. 5. 11. Original number 517. Collected 29th October, 1910, by Mr. G. L. Bates. Another, younger, specimen obtained in 1901 at Efulen, Cameroons.

Like as this pretty little mouse is to *E. alleni* and *E. stella* externally, the resemblance is only superficial, and its large *Nyctomys*-like brain-case, well-defined supraorbital ridges, and larger molars separate it readily from those species.

Georychus kummi, sp. n.

Near *G. ochraceo-cinereus*.

General external appearance as in *G. lechei*. Size rather smaller. Fur of medium length; hairs of back about 7 mm. Colour slaty grey, rather less brown than in *G. lechei*, not in any way sandy or "ochraceous." Coronal white spot smaller than in *lechei*, and not extended posteriorly as a white line on the nape. Belly with a white median line.

Skull very much as in *G. ochraceo-cinereus*, smaller than that of *G. lechei* ; nasals not expanded mesially, their sides parallel from front nearly to back ; orbits defined behind by strongly marked postorbital processes, interorbital breadth slightly less than intertemporal. Lambdoid crest well developed, continued directly across skull without the median anterior inflection so marked in *lechei*. Postero-external angles of zygomata strongly marked. Diastema comparatively short. Bullæ small.

Dimensions of the type :—

Hind foot (s. u.) 29 mm.

Skull : condylo-basal length 42·4 ; condylo-incisive length 44·6 ; zygomatic breadth 31·5 ; nasals 15·2 × 3·2 ; interorbital breadth 9 ; breadth across postorbital processes 13 ; intertemporal breadth 9·2 ; mastoid breadth 20·8 ; palatilar length 24·7 ; diastema 12·6 ; upper tooth-series (crowns) 7·7.

Hab. French Shari Protectorate, about 8° N., 22° E., on the Ironstone Plateau. Alt. 2000′.

Type. Old female. B.M. no. 11. 4. 2. 1. Collected and presented by Dr. H. Karl W. Kumm, of the Soudan United Mission.

This fine mole-rat, which I have named in honour of its discoverer, is no doubt nearly allied to *G. ochraceo-cinereus*, Heugl., with which it shares its chief cranial characteristics. But its colour is of the slaty grey found in *G. lechei*, and quite unlike the sandy or ochraceous of Heuglin's species.

LXIX.—*The Genera of Recent Clypeastroids.* By Hubert Lyman Clark, Museum of Comparative Zoology, Cambridge, U.S.A.

Although the classification of the sea-urchins commonly called cake-urchins, sand-dollars, and keyhole-urchins has engaged the attention of many zoologists, some of whom have held very high rank, the nomenclature in use at the present day is very unsatisfactory. That which is used by palæontologists differs from that of their brethren who confine their work to Recent forms, and such a name as *Echinanthus*, for example, means something quite different in one field from what it does in the other. The difficulties seem to arise chiefly from the fact that leading echinologists, such as the two Agassizs, Duncan, and Lambert, have refused to accept the tenth edition of the 'Systema Naturæ' as the starting-point in nomenclature, but have dated both genera and species from pre-Linnean writers. Other articles of our present International Code of Nomenclature have also been consciously or unconsciously violated, and thus the confusion has been made worse.

Having had occasion recently to outline for my own use a consistent and satisfactory classification of the Recent Clypeastroida, I have found that the application of the International Code results in some important changes; and as I believe these changes are bound to be made ultimately, they had better be suggested at once. Fortunately few familiar names are altered, and none of these is likely to cause any confusion. Of course, those who persist in the maintenance of pre-Linnean names cannot accept my conclusions, and I shall not expect it; but I do hope that those who wish to obtain a reasonable stability of nomenclature through the general acceptance of the International Code will find themselves able to accept the types here given for the different genera, even if their own methods or preferences would have led them to different results. I hope it is needless to add that if I err in the application of the code or in the

statement of any case, I shall consider it a great favour to be promptly corrected.

In the tenth edition of the 'Systema Naturæ' Linné includes in his genus *Echinus* four nominal species (*rosaceus*, *reticulatus*, *placenta*, *orbiculus*), which it is universally agreed are clypeastroids. The references and figures which he cites under each name show that these species, with the exception of *placenta*, are composite groups, and not species as we understand the term to-day. The form named *Echinus placenta* is, however, a well-known East-Indian species, and there is not now and never has been any doubt as to its identity. The name *rosaceus* has been the source of much confusion, and unfortunately Lovén, in his very important and valuable work on the Echinoidea described by Linné (1887, Bihang Kgl. Svenska Vet.-Akad. Handl. xiii.), has not helped matters at all, because, as pointed out by Lambert (1905, Ann. Univ. Lyon, n. s. i. p. 142), he overlooked Lamarck's work published in 1801, which has an important bearing on the matter. As Lovén admits there is no authentic type specimen of *rosaceus*, we must judge of the species by what is published in the 'Systema Naturæ'; and there can be no doubt that the diagnosis and references given there (ed. x. p. 665) show conclusively that the name covers a composite group, including species of *Echinanthus*, *Clypeaster*, and *Laganum*, as those genera are used by A. Agassiz in the 'Revision of the Echini.' Leske (1778, Add. ad Klein) failed to differentiate these various forms satisfactorily, but elects to call the group *Echinanthus humilis*, admitting at the start that his name is a synonym of *rosaceus*. Lamarck, however, in 1801 (Syst. Anim. s. Vert. p. 342), recognizing the composite nature of *rosaceus*, restricted that name to the West-Indian species called in the 'Revision' *Echinanthus rosaceus*, and placed it as the first of two species in a new genus, *Clypeaster*. The other species (*pentapora*) he removed in 1816 to *Scutella*, and so *rosaceus* must be the type of *Clypeaster*. I fully agree with Lambert that Lovén's attempt to restrict the name *rosaceus* to the "species of the Eastern Seas, commonly named *Clypeaster placunarius*," is not only unconvincing and belated, but is most unfortunate.

What, then, becomes of the name *Echinanthus*? I regret that I cannot answer this question in agreement with either Lambert or Duncan. The reason, however, is obvious. They both go back to a pre-Linnean authority. Under the Code, which I am trying to follow, the fate of *Echinanthus*, Leske, the first post-Linnean writer to use the name, is

easily determined. Leske included only four species in his genus (*humilis, altus, ovatus, orbiculatus*), and of these *humilis* equals *rosaceus*, L., and with its near relative *altus* belongs in *Clypeaster*, where they were placed by Lamarck. In 1825 Gray removed *ovatus* to his new genus *Echinolampas*, and therefore *orbiculatus* alone is left to be the type of *Echinanthus*. As this species is generally agreed to be a *Pygurus*, Agassiz, the latter name becomes a synonym of *Echinanthus*, unless it contains, as established by Agassiz, one or more species not congeneric with *orbiculatus*, Leske.

If, then, the name *Echinanthus* is no longer available for a clypeastroid, and if *Clypeaster*, Lamarck, must replace *Echinanthus* as used by A. Agassiz, what is the proper name for the group called *Clypeaster* in the 'Revision'? Personally I think it is practically impossible to separate the two groups. It is true that the internal structure of the test of *rosaceus* is strikingly different from its West-Indian ally *subdepressus*, Gray; but one cannot separate the Pacific forms by a corresponding difference, and I think we must consider the condition in *rosaceus* as simply a specific character. There can be no doubt that increasing age brings an increasing amount of calcareous matter for deposit in the test of clypeastroids, and we must therefore be on our guard against placing too much weight upon characters shown by the internal structure of the test. If, however, it is desirable to distinguish *rosaceus* generically from its nearest allies, the latter may bear the name *Stolonoclypus* proposed by A. Agassiz in 1863. The type of this genus I will here designate as *Clypeaster prostratus*, Ravenel, = *Echinanthus subdepressa*, Gray.

The species called *reticulatus* by Linné is a more inexcusable composite than *rosaceus*, as it is made up of two utterly unlike clypeastroids: one is *rosaceus* itself, as clearly shown by Sloane's figures to which Linné refers; while the other, indicated by references to Gualtieri's pl. cx. fig. D, is the little Indo-Pacific species long known as *Clypeaster scutiformis* (Gmel.). The difference in Linné's diagnoses of *rosaceus* and *reticulatus* is so trivial that it needs no consideration. Lovén's attempt in 1887 (*l. c.*) to delimit *reticulatus* was anticipated over a century earlier by Leske, who, in 1778, clearly restricted the name *reticulatus* to the Indo-Pacific form. As A. Agassiz showed this in the 'Revision,' I am at a loss to understand why he preferred the later name *scutiformis*.

Returning again to Linné's list, we find the fourth species (*orbiculus*) recognized as a composite by its author, who

divides it into four varieties or forms. Fortunately the references to figures under these forms are sufficiently consistent, so that it is easy to determine to what species each form is to be referred. Leske recognized this fact, and gave each form a new name. He first selected the third one, and called it *Echinodiscus quinquiesperforatus*; next he removed the fourth form as *Echinodiscus orbicularis*; next comes the second, which he called *Echinodiscus deciesdigitatus*. The name *orbiculus* is thus left for the first form alone, and Leske's name *dentatus*, which he gave last of the four, must be regarded as a synonym. As Agassiz in 1841 placed this species (under a pre-Linnean name) in his genus *Rotula*, where it has since remained, it becomes the type of that genus by virtual tautonomy, if for no other reason.

The first post-Linnean writer whose work affects clypeastroid nomenclature is Leske, 1778. The idea of dating *Echinocyamus* and *Echinoneus* from Van Phelsum, 1774, seems to me absurd. It is true that he uses both names, but he is not a binomial writer, his diagnoses are inadequate, and he gives no species under either "genus." Even if we wished to, we could not use generic names which are neither adequately diagnosed nor assigned any constituent species. The question whether we accept these names of Van Phelsum or not is unimportant, however, for our nomenclature will not be affected, but only the date and author of the two names*. It may be added that if we are to date these names from Van Phelsum, then Agassiz's name *Heliophora*, proposed in 1840, has precedence over the universally used name *Rotula*, Agassiz, 1841. *Heliophora* has been rejected, and rightfully it seems to me, because it has no constituent species, and therefore cannot be assigned a type; and this is the status of *Echinocyamus* and *Echinoneus* of Van Phelsum. For my part I do not see how, under the Code, such genera can be maintained. Under Article 30 we read—"In no case . . . can a species be selected as type which was not originally included in the genus"; and I do not see how one can determine what species are included in a genus, where no species at all are mentioned, unless, indeed, the diagnosis is exceptionally exact.

Leske (1778, Add. ad Klein) groups his clypeastroid

* Mortensen's argument (1907, 'Ingolf' Ech. pt. 2, p. 38) seems to me sufficient to dispose of Lambert's most unwelcome attempt to upset the hitherto universally accepted usage of the names *Echinocyamus* and *Fibularia*. But personally I cannot consider Van Phelsum entitled to consideration in this matter.

species in four genera—*Echinodiscus, Echinanthus, Echinocyamus,* and "Genus 1." The fate of *Echinanthus* with its constituent species has already been discussed. The determination of the type of *Echinodiscus* is by no means easy. Lamarck ignored the genus, but Gray (1825, Ann. Phil. x.) accepted it and only removed one of Leske's fifteen species. This one (*E. laganum*) he placed in a new genus, which he called *Lagana,* a misprint (as shown by his quotation from Klein) for *Laganum* *. By tautonomy Leske's species becomes the type of the genus. Blainville (1830, Dict. Sci. Nat. lx.) used the name *Echinodiscus,* but as he did not include even one of Leske's fifteen species, his work can hardly be said to help in the selection of a type. However, he correctly placed Leske's *E. orbicularis* in Gray's genus *Laganum.* It was not until Agassiz's monograph 'Des Scutelles' appeared in 1841 that Leske's heterogeneous group was broken up. Of the thirteen species still in *Echinodiscus,* Leske, in 1841, we may dismiss *rosaceus* as unrecognizable, and probably not an echinoid, while *reticulatus* is clearly a *Clypeaster.* Of the eleven remaining species Agassiz puts *dentatus, octiesdigitatus,* and *deciesdigitatus* in his new genus *Rotula*; for *quinquiesperforatus* and *sexiesperforatus* he establishes *Mellita*; *emarginatus* and *quaterperforatus* he included in his genus *Eucope*; *bisperforatus, auritus,* and *inauritus* he called *Lobophora*; and *subrotundus* he places first in the Lamarckian genus *Scutella.* As this is the only one of the species placed in *Scutella* by Lamarck, which Agassiz also places in that genus, it is certainly desirable, if not absolutely obligatory, to consider it the type. It will be noticed that Agassiz makes four new genera out of Leske's *Echinodiscus,* but ignores the name. Of the four genera *Lobophora* is the last established, and ought therefore to bear the old name; and this is peculiarly fortunate, for the name *Lobophora* is preoccupied and could not therefore be used. A. Agassiz first called attention to this in the 'Revision,' and restored Leske's name to the genus. No type has ever been selected, and I therefore choose *E. bisperforatus,* Leske, second variety, which "longiora et angustiora linearia que foramina offert." I specify this variety because the other was named *Lobophora truncata* by Agassiz (1841); and although Fourtau (1904,

* The attempt to date this name from Meuschen, 1787, seems to me most unfortunate. He is not a binomial writer, and I have no patience with revising the names of his catalogue. Many familiar Echinoid names must take on a new meaning if his work is to be accepted.

Bull. Inst. Egypt, (4) iv.) confirms A. Agassiz's view that the two are identical, it is desirable to have decided which is the typical form.

Leske's genus *Echinocyamus* contains thirteen nominal species, all based on Van Phelsum's figures. Lamarck (1816) includes the same group, so far as he recognizes them at all, in his genus *Fibularia*. The two names were used interchangeably for many years, some writers using Leske's and others preferring Lamarck's, until, in 1847, Agassiz and Desor (Ann. Sci. Nat. (3) vii. pp. 140–142) restricted *Echinocyamus* to the flat forms ("Oursins plat") and *Fibularia* to the high ones ("Forme subsphérique ou ovoïde"). As *angulosus* is the only one of Leske's thirteen species which they mention, and as it stands first in their list of *Echinocyamus* species, it may well be considered the type of that genus. Under *Fibularia* they mention two of Lamarck's species, *ovulum* and *trigona*; but as the former is now generally considered a synonym of the latter, *trigona* is doubtless the type of the genus.

Were the history of the name *Echinarachnius* exactly as recounted in the 'Revision of the Echini,' it would be impossible for us to retain it for the sand-dollars in the sense in which it has been used for seventy years; but fortunately quite another interpretation of Leske's use of the name than that given in the 'Revision' is not only permissible, but is apparently more reasonable. On p. 153 of his 'Additamenta ad Klein' Leske refers to a clypeastroid under a "Genus 1" which he says Van Phelsum called *Echinarachnius*, and on the next page (154) he describes it as "Species 74, *Echinarachnius*." Further on he says it is identical with *Echinus placenta*. L. Van Phelsum, however, did not call the animal *Echinarachnius*, and on p. 8 Leske himself translates Van Phelsum's colloquial name as *Arachnoides*, which is Klein's "Genus unicum" and obviously Leske's "Genus 1." Is it not clear, then, that it is no mistake of Leske's in calling *Echinarachnius* a species rather than a genus? He evidently intends to retain Klein's name *Arachnoides* for the genus, and as Klein gives no specific name, Leske proposes *echinarachnius*, but states that it is equivalent to *placenta*, L. Gray (1825, *op. cit.*) errs in attributing the genus *Echinarachnius* to Leske, for he was himself the first writer to use the name as a generic term. He includes three species in his genus—*placenta*, L., and *Scutella parma* and *lenticularis*, Lamk. In 1841 Agassiz restored *placenta* to the genus *Arachnoides* and put *lenticularis* in *Scutellina*, so that *parma* becomes the type of *Echinarachnius*. As *placenta* is the only

species in *Arachnoides*, it is obviously the type. There is room for difference of opinion as to whether *Arachnoides* should date from Leske or Agassiz; but as I have no doubt that the "Genus 1" of the former is *Arachnoides*, Klein, and as Leske himself uses that name on p. 8, it seems to me right to date the genus from the 'Additamenta.' Fourtau (1904) has attempted to substitute *Echinodiscus* for *Arachnoides*, but as his argument is based on the acceptance of pre-Linnean names, it does not concern us here. Ortmann (1902) believes that *Echinarachnius* is not distinguishable from *Scutella*; but I cannot agree with him, for the differences between the petals of a typical *Scutella* (like *subrotunda*) and those of *Echinarachnius* are sufficiently important from the phylogenetic point of view to warrant generic separation, in spite of the existence of perplexing connecting forms. The genus *Dendraster* was proposed by Agassiz and Desor (1847) for the remarkable sand-dollar of the North Pacific called *Scutella excentrica* by Eschscholtz. In the 'Revision' this genus is considered a synonym of *Echinarachnius*; but I cannot believe this is desirable, for *excentrica* is quite unique in several important characters, and in my judgment *Dendraster* should be retained.

The genera *Peronella*, Gray, *Anomolanthus*, Bell, *Alexandria*, Pfeffer, and *Astriclypeus*, Verrill, were all monotypic when established, so there is no room for doubt as to their types. I am quite unable to follow Bell's (1883, Ann. & Mag. Nat. Hist., February) line of argument, by which he endeavours to dissociate *Peronella* from Gray. To my mind it is perfectly clear that Gray established *Peronella* as a subgenus for *Laganum peronii*, Agass. I am by no means clear as to the exact limits of *Peronella* as a generic term at the present day, but I am inclined to think it may well be used to include the species, otherwise referred to *Laganum*, which have only four genital pores.

In spite of their long-continued use, the genera *Eucope* and *Mellita*, so far as I can discover, have never had any types designated. For the former I would choose the species called *Echinodiscus emarginatus*, Leske, which seems to have been the longest known of any species. For *Mellita* I select *quinquiesperforatus*, Leske, both because it has page precedence over *sexiesperforatus* and because it seems to be a commoner and more generally known species. I greatly regret that the shorter and much more euphonious names given by Gmelin ten years later to these two species may not be used, but it would involve a deliberate violation of the Code. The fact that Leske wrote the specific name in two

parts, a numeral and a participle, might be construed as an indication that the full names (*Echinodiscus quinquies perforatus* or *5 perforatus* and *E. sexies perforatus* or *6 perforatus*) are not binomial, and this would clear the way for Gmelin's names; but this seems to me such an unworthy quibble, I cannot bring myself to adopt it.

Other genera which have been suggested at different times for Recent clypeastroids seem to me to lack sufficient reason for being. Thus the genera *Diplothecanthus* and *Plesianthus*, Duncan, are due to the recognition of the wrong type for *Clypeaster* and the laying of too much stress on the internal structure of *C. rosaceus*. *Mellitella* is based on a remarkable misconception by Duncan of the character of its type species, *Mellita stokesii* (Agass.). He states that the lunules remain open as marginal slits. It is possible that he drew this conclusion from the figure given by A. Agassiz in the 'Revision'; but he would have avoided error had he read the description given in that work, for Agassiz distinctly says that the lunules may be completely closed, as in other species of *Mellita*. I may add here that I think there is no longer any good reason for doubting that *stokesii* is simply the young of *Encope micropora*; hence *Mellitella* becomes a synonym of *Encope*. The genus *Moulinia*—or *Moulinsia* as emended by Duncan,—established by Agassiz in 1841 for a little clypeastroid from Martinique, is maintained by Duncan, 1885, although Lütken and A. Agassiz considered its type to be a young *Encope*. A re-examination of the available evidence has satisfied me that Lütken and A. Agassiz were right, and I have therefore discarded the name.

The more one considers the various characters by which the families and genera of the clypeastroids are to be distinguished, the clearer it becomes that the position of the auricles and their relation to each other is of very great importance, although little weight has been attached to it hitherto. The condition of the actinal ambulacral furrows is also an important character, and fortunately is easily observed. The arrangement and relative size of the interambulacral plates are characters usually difficult to make out in adults, and as they are almost certainly correlated with the shape of the test, too much stress should not be laid on them. It is hard to decide how much weight may properly be given to the arrangement of the internal calcareous supports. It is hard to believe that it is of any great significance, and it seems almost certain that the differences are, in part at least, due to age. The distinction between

Echinocyamus and *Fibularia* is mainly in this character, and in these genera there is no reason to question the constancy and systematic value of the difference. But having satisfied myself that "*Mellita stokesii*" is only the young of *Encope micropora*, I am bound to say that I consider the internal structure of the test of little taxonomic importance in the Encopes and their allies; and having found the greatest difficulty in making use of the character in *Clypeaster* and *Laganum*, I have practically ignored it.

The development of lunules in the more specialized clypeastroids affords an obvious, constant, and most interesting character; but how much weight is to be attached to their manner of formation we do not know. Is *Mellita sexies-perforatus* unique in the process of formation of its ambulacral lunules? What significance does its characteristic method have? Is it of taxonomic importance? Not being able to answer these questions, I suggest them as worthy of further investigation. The form of the petals is of course a good character, but it is well known that even a single species may show great diversity not only in the relative length and width, but in the degree of closure at the distal end. The position of the anus is an important character, but as it shows relatively little difference in adults it is only occasionally of practical value. The form of the test seems to be the most easily modified character, and little weight can be placed on it in determining relationships. Attention has been called by De Meijere to some interesting differences between the spines of *Laganum* and *Clypeaster*; but as I have not found it necessary to use this character and have not yet examined all the genera in this particular, I have nothing to add to his valuable account (1904, 'Siboga' Ech. pp. 103 *et seq.*). The pedicellariæ also show characters which may be useful for help in distinguishing species and genera, but they have not seemed to me of sufficient importance to take them into account here.

There can be little question that *Echinocyamus* and *Fibularia* belong in a family by themselves, but I do not think this can be considered a primitive group. Such simplicity of structure as they show is probably associated with their small size, while their fused auricles and the structure of the interambulacra strongly suggest relationship to *Laganum*.

In my judgment the most primitive of the Recent Clypeastroida is probably *Anomolanthus* or those species of *Clypeaster* with wide open petals such as *C. ravenellii*, A. Ag. In these forms the auricles are paired, well separated, and ambulacral

in position (this is assumed for *Anomolanthus*, as neither the describer of the unique type species nor the zoologist who established the genus refer to this most important character), there are five genital glands and pores, only slightly petaloid ambulacra, and small paired interambulacral plates in contact with each genital. In *Clypeaster* the interambulacra may become discontinuous in the adults, *i. e.* the primordial interambulacral plate becomes separated by ambulacral plates from the rest of the interambulacrum. It would be very interesting to know whether this is also true of *Anomolanthus*, for the high test and marginal anus of that genus show a less degree of specialization than is shown by any Recent *Clypeaster*.

With the increasing tendency to a subarenaceous life the depression of the test has gone on rapidly in the Clypeastroida, the extreme being reached in *Arachnoides placenta*. Curiously enough, however, except for the discontinuous interambulacra, doubtless associated with the flatness of the test, *Arachnoides* is otherwise quite a primitive form, as evidenced by the paired ambulacral auricles and the supra-marginal anus. The ambulacra, too, are only slightly petaloid. How the real relationships of this remarkable clypeastroid can best be shown is, of course, debatable, but it seems to be contrary to the evidence to separate it widely from *Clypeaster*, and yet I cannot believe it ought to be placed in the same family with that genus. I therefore recognize two distinct but nearly related families, the Clypeastridæ and the Arachnoididæ.

While *Arachnoides* is thus superficially very unlike *Clypeaster* but really nearly related, *Laganum* represents the other extreme, for it is superficially much like *Clypeaster* but in reality is quite different. In the fused auricles, interradially placed, and in the very narrow continuous interambulacra with a large and apparently (though not really) unpaired abactinal plate adjoining the genital, *Laganum* shows structural progress that makes it improper to place it in the same family with *Clypeaster*. The peculiar character of the interambulacra, combined with the straight, simple, actinal ambulacral furrows, prevents our placing it in the same family with *Scutella* and its allies, and it is therefore necessary to recognize the family Laganidæ.

The remainder of the clypeastroids form quite a homogeneous group with more or less discoidal tests, fused auricles, interradially placed, interambulacra beginning abactinally in a pair of small plates next the genital, and with actinal ambulacral furrows more or less forked or

branched*. This group has long been known as the Scutellidæ, and while there are obvious reasons why it is preferable that the type genus of a family should, if possible, be one with Recent species, it would be worse than absurd to abandon this ancient and euphonious name for no better reason than that all known Scutellas are fossil.

We thus find it desirable to recognize five families, which seems like an excessive number for only fifteen genera, especially since eight of the genera clearly belong to one family. But I do not see how the number can be lessened without obscuring real relationships. The Clypeastridæ are almost certainly the nearest of the families to the original stock, and it is not hard to believe that the Laganidæ have had a common ancestry with them. The Fibulariidæ seem to have been derived from the Laganidæ, or from its near ancestor, by a process of simplification. The Arachnoididæ are certainly an old stock beginning on or near the Clypeastrid branch and with no near relatives at the present day. The Scutellidæ are quite a distinct branch, though their origin is probably very near that of the Laganidæ, if not identical with it.

The five families and their constituent genera may be distinguished by the following key. For convenience I have included *Scutella*, the type genus of the Scutellidæ, although it contains no Recent species.

Auricles separate, each placed more or less clearly on the ambulacrum.
  Test not discoidal and seldom very flat; anus not supra-marginal; genital pores 5. (CLYPEASTRIDÆ.)
    Poriferous areas of petals divergent, not incurved distally; anus marginal ..... *Anomolanthus.*
    Poriferous areas of petals more or less incurved distally; anus submarginal ..... *Clypeaster.*
  Test exceedingly flat, discoidal; anus supra-marginal; genital pores 4. (ARACHNOIDIDÆ.)
    With characters of the family ..... *Arachnoides.*
Auricles more or less fully fused into a single piece, situated on the interambulacrum.
  Actinal ambulacral furrows short and indistinct or

* They are not branched in *Alexandria*, and often only indistinctly so in *Echinarachnius*. Duncan's suggestion that *Alexandria* "appears to be an *Arachnoides* with a posterior notch" indicates that he neither read Pfeffer's description nor examined carefully the photograph given, in which the interambulacra may be seen to be continuous.

wanting; abactinal end of each interambulacrum consists of a single large plate adjoining genital; test not usually discoidal and never with marginal slits or lunules.
Petals more or less perfect; madreporic pores numerous; size moderate to large, 15 mm. and up in length. (LAGANIDÆ.)
Genital pores present in all interradii ..... *Laganum.*
Genital pore wanting in posterior interradius.. *Peronella.*
Petals reduced and often rudimentary; only one madreporic pore; size small, rarely up to 15 mm. in length. (FIBULARIIDÆ.)
Test more or less elevated, without internal radiating walls, except usually posteriorly. *Fibularia.*
Test more or less flattened, with internal radiating walls bounding the ambulacra .. *Echinocyamus.*
Actinal ambulacral furrows distinct, at least the posterior, and usually all, extending to ambitus; abactinal end of interambulacrum with the usual pair of small plates adjoining genital; test commonly more or less discoidal, often with marginal slits or lunules. (SCUTELLIDÆ.)
Test without marginal slits or lunules.
Actinal ambulacral furrows unbranched; genital pores 5; abactinal system very small ..... *Alexandria.*
Actinal ambulacral furrows more or less forked or branched; genital pores 4.
Petals more or less nearly closed distally .. *Scutella.*
Petals broadly open distally.
Abactinal system at apex of test; anus marginal; petals subequal..... *Echinarachnius.*
Abactinal system posterior to apex of test; anus on actinal surface; posterior petals much shorter than others .... *Dendraster.*
Test with marginal slits or lunules or both.
Not more than two marginal slits, and often none, in posterior half of test-margin.
No lunule in posterior interambulacrum.
Two lunules or marginal slits present, one in each posterior ambulacrum ..... *Echinodiscus.*
Five lunules present, one in each ambulacrum ..... *Astriclypeus.*
A lunule in posterior interambulacrum.
Genital pores 5 ..... *Eucope.*
Genital pores 4 ..... *Mellita.*
More than eight marginal slits in posterior half of test-margin ..... *Rotula.*

A list of these genera, with their types and other important data, follows:—

ANOMOLANTHUS, Bell, 1884. Proc. Zool. Soc. London, p. 43. Type, *Echinanthus tumidus*, Tenison-Woods, 1878, Proc. Linn. Soc. N.S.W. ii. p. 169. Monotypic.

CLYPEASTER, Lamarck, 1801. Syst. Anim. s. Vert. p. 349. Type, *Echinus rosaceus*, Linné, 1758, Syst. Nat. ed. 10, p. 665, = *Echinanthus rosaceus* of Gray, 1825, A. Agassiz, 1872, et al. Type fixed by elimination by Lamarck, 1816, Anim. s. Vert. iii. p. 13.

ARACHNOIDES, Leske, 1778. Add. ad Klein, pp. 8 & 154. Type, *Arachnoides echinarachnius*, Leske, *l. c.*,=*Echinus placenta*, Linné, 1758, Syst. Nat. ed. 10, p. 666. Monotypic.

LAGANUM, Gray, 1825. Ann. Phil. x. p. 5 (*Lagana*, by error). Type, *Echinodiscus laganum*, Leske, 1778, Add. ad Klein, p. 140,= *Laganum bonani*, Agassiz, 1841, and later writers. Type by tautonomy.

PERONELLA, Gray, 1855. Cat. Recent Ech. pt. i. p. 13. Type, *Laganum peronii*, Agassiz, 1841, Mon. Scut. p. 123. Monotypic. Proposed as a subgenus.

FIBULARIA, Lamarck, 1816. Anim. s. Vert. iii. p. 16. Type, *Fibularia trigona*, Lamarck, *l. c.*,=*Echinocyamus craniolaris*, Leske, 1778, Add. ad Klein, p. 150. Type fixed by elimination by Agassiz and Desor, 1847, Ann. Sci. Nat. (3) vii. p. 142. Since Agassiz and Desor's work permits either *trigona* or *ovulum* to be the type, I will designate the former, although I have no doubt both are synonyms of Leske's *Echinocyamus craniolaris*.

ECHINOCYAMUS, Leske, 1778. Add. ad Klein, p. 149. Type, *Echinocyamus angulosus*, Leske, *op. cit.* p. 151,=*Echinus minutus*. Pallas, 1774, Spic. Zool. x. (usually quoted erroneously as ix.) p. 34, pl. i. fig. 25, as delimited by Leske, *op. cit.* pp. 150–152. Type fixed by elimination by Agassiz and Desor, 1847, Ann. Sci. Nat. (3) vii. p. 140.

ALEXANDRIA, Pfeffer, 1881. Verhandl. Naturw. Ver. Hamburg von 1880, p. 63. Type, *Alexandria magnifica*, Pfeffer, *op. cit.* p. 64. Monotypic.

SCUTELLA, Lamarck, 1816. Anim. s. Vert. iii. p. 7. Type, *Echinodiscus subrotundus*, Leske, 1778, Add. ad Klein, p. 142. Type fixed by elimination by Agassiz, 1841, Mon. Scut. p. 76.

ECHINARACHNIUS, Gray, 1825. Ann. Phil. x. p. 6. Type, *Scutella parma*, Lamarck, 1816, Anim. s. Vert. iii. p. 11. Type fixed by elimination by Agassiz, 1841, Mon. Scut. p. 89.

DENDRASTER, Agassiz and Desor, 1847. Ann. Sci. Nat. (3) vii. p. 135. Type, *Scutella excentrica*, Eschscholtz, 1831, Zool. Atlas, p. 19. Monotypic.

ECHINODISCUS, Leske, 1778. Add. ad Klein, p. 131. Type, *Echinodiscus bisperforatus*, Leske, *op. cit.* p. 132. Type limited by Agassiz, 1841, Mon. Scut. p. 62 (under name *Lobophora*), to either *bisperforatus*, *auritus*, or *inauritus* of Leske, and the first, in the form of its second variety, has been selected by me in the present paper, p. 597.

ASTRICLYPEUS, Verrill, 1867. Trans. Conn. Acad. i. p. 311. Type, *Astriclypeus manni*, Verrill, *l. c.* Monotypic.

EUCOPE, Agassiz, 1841. Mon. Scut. p. 45. Type, *Echinodiscus emarginatus*, Leske, 1778, Add. ad Klein, p. 136. Type fixed in the present paper, p. 599.

MELLITA, Agassiz, 1841. Mon. Scut. p. 34. Type, *Echinodiscus quinquiesperforatus*, Leske, 1778, Add. ad Klein, p. 133. Type fixed in the present paper, p. 599.

ROTULA, Agassiz, 1841. Mon. Scut. p. 23. Type, *Echinus orbiculus*, Linné, 1758, Syst. Nat. ed. 10, p. 266, as delimited by Leske, 1778, Add. ad Klein, pp. 133, 144, 146,=*Rotula rumphii*, Agassiz, 1841, and later writers. Type by virtual tautonomy.

Cambridge, Mass.,
March 1911.

LXX.—*Three new Mammals from the Lower Amazons.*

By Oldfield Thomas.

(Published by permission of the Trustees of the British Museum.)

Thanks to the kindness of the authorities of the Goeldi Museum, Para, I have had the privilege of working out a collection of small mammals made by the Director of that Museum, Fräulein Dr. E. Snethlage, on the Lower Tocantins —chiefly at Cametá, besides a certain number of specimens obtained at Para itself. Among these there are several rare and interesting species, and the following three new ones :—

Callicebus emiliæ, sp. n.

Rufous-bellied group. Back rich bay or hazel.

Upper surface, instead of the usual grizzled greyish brown found in most of the rufous-bellied Titis, rich rufous bay, or hazel*, this colour covering the whole back, from the occiput to the rump. On the nape the hairs are grizzled brown and whitish, with rufous tips ; on the back they are dark smoky brown for two-thirds their length, their terminal third rich hazel. Crown greyish, more whitish anteriorly. Ears ashy grey, the long hairs on the antitragus tipped with black. Whole of under surface and inner side of limbs bright orange rufous. Fore limbs from shoulders to wrists, an ill-defined line along flanks (between the hazel of the back and the rufous of the belly), and hind limbs from hips to metatarsus grizzled ashy grey ; hands and posterior digits whitish. Tail chestnut-brown at base, then deep black (though the bases of the hairs are whitish), the end with a whitish tuft.

Measurements of the type (measured on skin) :—

Head and body 320 mm. ; tail 400 ; hind foot 81.

Hab. Lower Amazons. Type from the Para Zoological Gardens.

Type. Adult female. B.M. no. 11.4.28.1. Presented by the Goeldi Museum, Para.

This most handsome and striking species is distinguishable at a glance by the rich deep hazel or maroon-chestnut of its back, no other *Callicebus* having any such coloration. Its nearest allies would seem to be *C. donacophilus*, *moloch*, *ornatus*, and *remulus*, but the back in all of these is of the

* No figure in Ridgway quite matches the colour, which is darker, richer, and more vivid than "hazel."

ordinary grizzled greyish, at most with a slight rufous suffusion.

I have great pleasure in naming this beautiful monkey in honour of Fräulein Dr. E. Snethlage, by whose personal efforts our knowledge of the mammalogy of the Lower Amazons is being so rapidly increased.

Mesomys stimulax, sp. n.

Smaller than *M. ecaudatus*, and with shorter muzzle.

General characters as in *M. ecaudatus*, from which I think "*Echimys ferrugineus*," Günth., cannot be separated *. Size rather smaller. Colour above rather paler and more buffy, but the difference is not great. Below, however, instead of the whole under surface being uniformly buffy, the throat, axillæ, centre of chest, and inguinal region are white, while the belly is more fawn-coloured. Whiskers and long hairs round ears blackish. Hands and feet drabby whitish, without buffy suffusion. Tail uniformly brown, thinly tufted terminally.

Skull smaller than that of *M. ecaudatus*, the difference being almost entirely due to the considerable shortening of the muzzle. Nasals shorter than in *ecaudatus*, parallel-sided mesially, narrowed in front, instead of being decidedly broader anteriorly than posteriorly. Supraorbital edges well developed. Bullæ decidedly smaller than in *ecaudatus*, their antero-internal corner not projecting angularly forwards.

Teeth as in *ecaudatus*.

Dimensions of the type (measured in flesh) :—

Head and body 158 mm.; tail 122; hind foot 29; ear 13.

Skull: greatest length 41; condylo-incisive length 36·8; zygomatic breadth 21·6; nasals 11·5×4·3; interorbital breadth 11·5; breadth of brain-case 17·3; palatilar length 13·6; diastema 9; palatal foramina 4; upper molar series 6·6.

Hab. Cametá, Lower Tocantins.

Type. Old female. B.M. no. 11. 4. 28. 29. Original number 69. Obtained 11th February, 1911, by Fräulein Dr. E. Snethlage.

The specimen had been kept some time in captivity, but the differences in the skull are not such as would have been affected by this circumstance. Both skull and teeth are without any trace of disease.

* *Cf.* Ann. & Mag. Nat. Hist. (7) xv. p. 590 (1905).

This is only the fifth recorded specimen belonging to the rare genus *Mesomys*. The species will probably prove to range the whole length of the River Tocantins, just as *M. ecaudatus* would appear to occur from the Huallaga to the mouth of the Amazon.

Kerodon palustris, sp. n.

Allied to *K. spixi* and *K. boliviensis*.

General colour above near "wood-brown" about as in pale little-annulated specimens of *K. spixi*, the light mark on the head behind the ear practically obsolete. Under surface soiled whitish, or pale isabella, little contrasted with the colour of the flanks; very different to the white of *K. spixi* and more as in *K. boliviensis*; the hairs pale slaty basally, dull creamy terminally.

Skull in general shape most like that of *K. spixi*; nasals parallel-sided; interorbital region broad and flat; median vertical ridge on supraoccipital obsolete; anterior border of mesopterygoid fossa intermediate between the broad opening of *K. spixi* and the narrow one of *K. boliviensis*; in *K. spixi* the front edge of the fossa corresponds nearly with either end of Ridgway's "elliptical oval" (pl. xvi. fig. 10), while in the present animal it is as in the right half of "elongate ovate" (fig. 5). Bullæ smaller than in either of the allied species.

Incisors completely deep yellow ("orange-buff") in front, the allied species having them whitish on their outer half, and the yellow part paler; their section comparatively shallow, as in *boliviensis*, their depth, from front to back, but little greater than the breadth of either of them.

Dimensions of the type (measured in the flesh):—

Head and body 225 mm.; hind foot 46; ear 25·5.

Skull: greatest length 55; condylo-incisive length 47·7; greatest breadth 30; nasals 21 × 9; interorbital breadth 11·6; palatilar length 23·2; breadth of mesopterygoid fossa 4·8; upper tooth-series (crowns) 11·7.

Hab. Cametá, Lower Tocantins.

Type. Adult female. B.M. no. 11.4.28.34. Original number 62. Collected 3rd January, 1911, by Fräulein Dr. E. Snethlage; presented by the Goeldi Museum, Para.

From *K. spixi*, to which on geographical grounds this cavy might have been expected to be most allied, it differs by its slender incisors, narrower and differently shaped mesopterygoid fossa, much smaller bullæ, and less white underside—in some of which characters it shows affinity with *K. boliviensis*.

LXXI.—*A new Kangaroo from the Northern Territory of Western Australia.* By Oldfield Thomas.

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I owe to the kindness of Mr. B. H. Woodward, of the Western Australian Museum, the opportunity of examining the specimens on which the following new subspecies is founded:—

Macropus robustus bracteator, subsp. n.

Near *M. r. woodwardi*, but longer-haired, and browner, less rufous. Fur, compared with that of *M. r. woodwardi* and *alligatoris*, long and thick, as in *M. r. cervinus* and *rubens*; hairs of nape wholly or partially directed forwards from a whorl on the withers.

General colour above pale "mars brown," the hairs "fawn" at base with black tips; the resulting colour not unlike that in the shorter-haired *alligatoris*. Chin brown; rest of middle line of under surface creamy white. Head like back. Ectote of ear brighter, tending towards russet; long hairs of entote white. Limbs whitish, darkening on the hands and feet to black on the digits. Tail whitish fawn, not darkening terminally.

Female not essentially different from male. The head is rather greyer; the ears browner, with a contrasted tuft of russet at their anterior base; limbs almost completely white, the digits scarcely darker.

Skull very like that of *M. r. woodwardi*, but those of all the subspecies are very like each other, and I am by no means satisfied as to the constancy of the cranial characters used by Mr. Schwarz * to separate the different forms. The upper profile of the present animal is unusually bowed; nasals convex in both directions; sides of nasal cavity less bowed outwards than in *rubens*; coronoid process of medium dimensions.

Dimensions of the type (measured in flesh):—

Head and body 965 mm.; tail 813; hind foot 316; ear 113.

Skull: greatest length 180; basal length 159; greatest breadth 94; nasals, length 81, greatest breadth 25, anterior breadth 19·4; intertemporal breadth 15; palatal length 110; length of secator 9·2.

* Nov. Zool. xvii. p. 96 (1910).

Hab. McClintock Range, Kimberley Gold Field, Far North of Western Australia.

Type. Adult male. B.M. no. 10. 12. 25. 8. Original number 56. Collected 17th July, 1909, by J. P. Rogers, and presented by the Perth Museum. Male and two females examined, the latter retained in the Perth Museum.

This subspecies differs from its nearest ally, *M. r. woodwardi*, of the Grant Range, further west, by its longer fur, less rufous colour, and the essential identity of the two sexes.

LXXII.—*Upon the* Dynamopinæ, *a new Subfamily of Lamellicorn Beetles.* By Gilbert J. Arrow.

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The preparation of catalogues of the less-known subfamilies of Scarabæidæ, which I have undertaken for the important series now in course of publication, has made it necessary to investigate the proper position of various obscure forms. Upon one of these, described by Mr. Semenow as *Dynamopus athleta*, I included in a recent paper (Ann. & Mag. Nat. Hist. 1911, vii. p. 394) a too-hasty note, based upon dissection of one of two specimens sent to me from India for identification. The specimens being in bad condition, I arrived at a conclusion which I must now retract. I have since been able to make a more satisfactory examination of another species of the genus, and have found that Mr. Semenow's supposition that the mandibles are concealed within the mouth is quite correct and my allocation of this anomalous little insect to the Orphninæ is not more tenable than his to the Hybosorinæ. The anterior prominences of the head which I believed to represent the mandibles are processes from the genæ of an altogether unique character, and the actual mandibles, unlike those of any genus with which it is possible to compare *Dynamopus*, are very small and completely concealed.

The real position of the genus is much more problematical than has been supposed. The most distinctive feature of that part of the Scarabæidæ to which it has been assigned consists in the correlation of the clypeus with the labrum and mandibles, the latter being always horizontally extended outside of the mouth-cavity and uncovered, a condition entirely different from that found here.

Two years later than Semenow's description, a little beetle

from Senegal was described by Fairmaire as *Xanthelæus plicifrons* and assigned to the Dynastinæ. This insect I have found to be undoubtedly congeneric with the Asiatic species, but, although the external aspect of the insect, and especially the form of the head, with its transverse ridges, suggest the Dynastinæ more than any of the Geotrupine subfamilies, this is an illusion, for the position of the spiracles between the abdominal segments and the thick extruded labrum dissipate that idea. With the Coprinæ it has nothing in common but the concealed mandibles and labrum. There is some resemblance to *Ægialia*, but this is not borne out by a careful comparison of the head and mouth-structure. To the Ochodæinæ there is little resemblance, except in the peculiar branched tibial spurs, and to the Orphninæ there is scarcely more. So completely characteristic of these groups and of the Hybosorinæ are the large extruded mandibles and labrum and short flat clypeus, that it seems equally impossible to find a place for this remarkable form in any of them, and the only remaining solution of the problem is the formation of a new subfamily, Dynamopinæ. It is not impossible that other enigmatical genera, two or three of which have not yet been carefully studied, may eventually find their proper place in this group.

The distinctive features may be summarized as follows :—

The body is very compact and convex, the legs short, the coxæ of each pair contiguous, the femora and tibiæ very massive, and the tarsi relatively minute. The front tibiæ are strongly curved inwards, the outer edge forming three strong blunt lobes. The four posterior tibiæ are greatly dilated at the ends and each has a strong transverse outer carina. The spur of the front tibia is flat and pectinate along its inner edge, and those of the posterior tibiæ are laminar, broad at the end, and cleft into radiating lobes, two or three in number in the inner spur and eight or ten in the outer one. The basal joint of the tarsi is long and the claws are very small and slender. The antennæ are 10-jointed, with a short 3-jointed simple and compact club. The eyes are moderately large, coarsely facetted, and divided by a canthus in front. The head bears two sharp transverse carinæ above, the clypeus is produced into a rather sharp point in the middle, and the genæ are produced into a pair of long, nearly parallel processes, curving a little upwards, pointed, and highly chitinous.

The labrum is protruded, thick, short, and broad, studded with stiff bristles and having its lateral angles prominent. The mandibles are very short, completely hidden within the

mouth, thin and scale-like, blunt at the extremity, with a strong molar tooth at the base. The maxilla has a long fleshy outer lobe and the inner lobe is strongly chitinized and furnished with a double row of extremely long and sharp teeth. The mentum is quadrate, with a terminal fringe of long hairs, and the ligula prominent and bilobed.

There is no stridulatory apparatus such as characterizes the Orphninæ, Ochodæinæ, and Idiostominæ.

The specimen I have dissected is a male, but I have found no external sexual distinction. The species is from the White Nile and is at present without a name. It is extremely close to *Dynamopus plicifrons*, Fairm., from Senegal, of which I have seen the type in M. René Oberthür's collection, but differs in having the pronotum more coarsely and less densely punctured. *Dynamopus athleta*, Sem., of Western Asia, is a rather smaller and relatively shorter insect.

The new species is shortly diagnosed as follows:—

Dynamopus semenowi, sp. n.

Læte rufo-testaceus, capite prothoracisque disco brunneis, capite omnino grosse rugoso; prothorace lato, grosse punctato, punctis antice confluentibus, postice discretis, lateraliter sparsis, disco postice lævissime impresso, lateribus fortiter arcuatis, angulis posticis nullis; scutello lævi; elytris profunde æqualiter punctato-striatis, interstitiis sparsissime punctatis.

Long. 9 mm., lat. max. 5 mm.

Hab. White Nile.

The specimens in the British Museum were collected many years ago by Mr. Petherick. The species is also contained in Herr Carl Felsche's collection.

LXXIII.—*New Species of Heterocera from Costa Rica.*—VIII. By W. Schaus, F.Z.S.

Syntomidæ.

Euagra delectans, sp. n.

♂. Palpi red on basal half, the apical half brown; frons buff; vertex and neck crimson; collar and thorax black, streaked with dark blue; abdomen above blue-black, ventrally white; fore coxæ white. Fore wings black, tinged

with purple ; a metallic-blue streak on base of costa, and a broader and brighter blue streak above submedian to near middle ; a large hyaline space between veins 2 and 3, not quite reaching termen. Hind wings blue-black ; a hyaline fascia from base below cell and vein 3 to close to outer margin.

Expanse 34 mm.

Hab. Guapiles.

Near *E. angelica*, Butl.

Propyria normani, sp. n.

♂. Body black ; the shoulders crimson. Fore wings leaden black ; a broad red stripe from entire base of wing above submedian, along costa, and tapering to apex, leaving the apical third of costa narrowly black. Hind wings purplish black ; some roseate on base of costa. Underneath similar, but the hind wings have the base of costa crimson.

Expanse 24 mm.

Hab. Alajuela.

Named after my young friend Norman Clark, of Alajuela.

Arctiadæ.

Parevia parnelli, sp. n.

♂. Palpi buff, shaded with red above. Frons, collar, and thorax dark lilacine brown ; vertex yellow, shaded with red in front and behind ; abdomen red above, with three small dark spots dorsally ; anal hairs yellow. Fore wings lilacine brown ; a red streak at base below submedian ; a small red spot medially and one postmedially on inner margin, the latter with another above submedian ; a large yellow spot medially on costa, its hind margin downcurved to median ; a smaller spot postmedially on costa, and a slightly larger one near apex ; a yellow space on outer margin, its inner edge straight from 5 to below 3, inbent to 2, and again straight to submedian ; the yellow spots all separated from dark portion by crimson lines. Hind wings yellow ; the outer margin broadly black, tapering at anal angle.

Expanse 22 mm.

Hab. Sixola.

Near *P. metachryseis*, Hmpsn.

Calidota rudis, sp. n.

♂. Palpi, frons, thorax, and fore wings lilacine brown ; vertex, collar, shoulders, and abdomen above orange ; a black

point on tegulæ and patagia; abdomen ventrally fuscous grey; legs brown. Fore wings: a black point and some ochreous hairs at base; a faintly darker subterminal shade, outcurved to vein 4, then straight to tornus. Hind wings thinly scaled, smoky brown; the base of costa luteous; the inner margin with yellowish-buff hairs.

Expanse 47 mm.

Hab. San Mateo.

Paranerita flexuosa, sp. n.

♀. Palpi and vertex yellow; frons, collar, and thorax violaceous; abdomen above crimson, underneath white; anus yellowish white. Fore wings roseate purple; a large yellow space on costa, its hind margin obliquely flexuous to vein 3, then upwardly oblique to above 4, and faintly incurved to costa; the apex and outer margin yellow, narrowly and lunular from 7 to below 5, then wider and straight to 3, incurved and oblique to just above tornus; a black edging to dark portion. Hind wings: cell and inner area roseate; costa narrowly yellow; otherwise black.

Expanse 28 mm.

Hab. Sixola.

Paranerita lophosticta, sp. n.

♂. Palpi and body above crimson; a large yellow spot on vertex, a transverse silvery-white band at base of abdomen dorsally; anal hairs yellow; body below white, fore coxæ and tibiæ red. Fore wings red, irrorated with violaceous; a yellow fascia, wide on middle of costa, crossed by a red streak on subcostal, narrowing between 3 and 4, and expanding on outer margin above tornus, and following narrowly the outer margin to apex; the red portions where next to yellow edged with crimson; a medial curved crimson streak below cell; a small yellow spot edged with crimson below cell towards base. Hind wings roseate, tinged with lilacine on costa; the outer margin excised at apex. Fore wings below with elongated fovea below cell clothed with white hairs.

Expanse 30 mm.

♀. The yellow fascia more constricted between 3 and 4; no yellow spot near base; hind wings red, normal.

Expanse 33 mm.

Hab. Sixola, Juan Vinas.

Near *P. carminata*, Schs.

Notodontidæ.

Azaxia dyari, sp. n.

♂. Palpi fuscous brown, shaded with reddish brown above; head buff; collar reddish brown and buff; thorax mottled green, lilacine, and dark grey; abdomen brown, basal tufts white, anal hairs tipped with dark red. Fore wings dark lilacine grey; the costal margin shaded with green; the inner margin whitish, the lines on it green and olive-brown; the apex and tornus whitish, shaded with green; a black basal line; antemedial geminate, the inner part heavier marked, and inbent on submedian; a darker medial shade and some medial green and reddish-brown shadings below cell and vein 2; a broad velvety black-brown lunate discal mark; veins on outer space irrorated with black; a fine reddish-brown, geminate, lunular, postmedial line; fuscous submarginal spots between 5 and 7. Hind wings whitish, irrorated with fuscous grey chiefly on outer margin, and leaving a faint postmedial white shade; a brown streak on inner margin; a fuscous spot at anal angle.

Expanse 34 mm.

Hab. Sixola.

Allied to *A. luteilinea*, Druce.

Antiopha? marcella, sp. n.

♀. Palpi dark brown, streaked with buff above; the second joint very long and heavily fringed. Head and collar mottled brown and buff; thorax mottled with grey; abdomen fuscous brown. Fore wings greyish buff, irrorated with brown; a darker basal shade not reaching inner margin; an inner fuscous-brown shade, angled at median, most noticeable between fold and submedian; a white streak at end of cell to discocellular, beyond which it forms a slight longitudinal crescent; a large brown shade below this is angled just below vein 2 and extends upwards postmedially to the costa, being outwardly limited by a whitish shade above vein 4; the outer margin dark, shaded and crossed by a submarginal, irregular, fine dark line. Hind wings fuscous brown, thinly scaled on inner margin; cilia whitish buff.

Expanse 34 mm.

Hab. Sixola.

Arhacia lignaris, sp. n.

♂. Palpi and frons brown; vertex buff, separated from brown frons by a darker brown line; some brown hairs at

base of antennæ; collar brown, darkest medially; thorax buff-brown, the patagia streaked with dark brown; abdomen buff, a dark brown dorsal tuft at base. Fore wings buff, shaded with pinkish brown; a greyish-brown shade through cell to termen between 5 and 7, interrupted at end of cell by buff and pale reddish-brown transverse streaks on and at either side of discocellular; a geminate dark brown streak below cell from base to middle of wing, surmounted and followed by a greyish-brown shade to below vein 5 near postmedial; a geminate fine brownish streak along submedian; the postmedial fine brownish, forming very deep and narrow curves, the inward curve between veins 4 and 5 marked with black; the margins, except at base of wing, dark reddish brown, streaked with fuscous brown; a whitish-buff subterminal line, angled and outcurved at submedian fold; a fine lilacine white line on outer margin and lighter brown shadings chiefly towards apex. Hind wings yellowish white; dark brown shadings at anal angle crossed by whitish lines. Underneath yellowish white; fore wings finely brown on costa towards apex and on cilia.

Expanse, ♂ 54 mm.

Expanse, ♀ 73 mm.

Hab. Sixola, Tuis.

Arhacia, H.-S., and *Lirimiris*, Wlk., had better be separated by the fasciculate antennæ in the former and the pectinated antennæ in the latter, as the separation of veins 3 and 4 on hind wings seems to vary. *A. combusta*, H.-S., is represented in the British Museum by three females, and I have not yet seen the male, which is well figured by H.-S.; the wings below are dark brown. *A.* (*Lirimiris*) *imitans*, Schs., differs in the pale costa of hind wings in ♂, and the buff-brown hind wings in ♀, also by the whitish-buff underside. *A. lignaris*, Schs., is readily distinguished from either by the dark shade beyond cell. *A. fascis*, Schs., *A. meridionalis*, Schs., and *A. elongata*, Schs., should be transferred to *Lirimiris*. *A. corina*, Schs., had also better be placed with these last species, although the antennæ are simple in the female.

Notoplusia eunoteloides, sp. n.

♂. Head and collar reddish brown; thorax violaceous brown, some grey shadings posteriorly; abdomen above lilacine brown, the last two segments greyish, with a dorsal dark point on last segment. Fore wings: the basal third dark brown, except on inner margin, which is grey, limited by a darker brown line, outwardly edged with whitish; outer

two-thirds grey, medially irrorated with darker grey and beyond with light brown ; a reniform brownish line at end of cell; a postmedial brown spot on costa and a larger postmedial spot on inner margin; vein 6 finely black ; a subterminal straight black line from vein 8 to vein 3, inset below 3 and below 2 ; faint traces of a terminal dark line near apex. Hind wings whitish, the veins tinged with brown; a faint terminal fuscous-grey shade.

Expanse 33 mm.

Hab. Avangarez.

Malocampa matralis, sp. n.

♀. Head and thorax dull brown, mottled with buff, and some whitish hairs on vertex ; abdomen darker brown above. Fore wings dull brown, shaded with yellowish buff on inner margin; traces of a darker geminate antemedial line on costa; two black spots on discocellular, finely edged with lighter brown ; short postmedial greyish streaks on veins, preceded and followed by a few black scales; terminal black spots between the veins; cilia buff at tornus, otherwise brown, with darker shades at veins. Hind wings dull dark brown; a fuscous-brown spot at anal angle, surmounted by a buff spot; cilia yellowish buff.

Expanse 50 millim.

Hab. Juan Vinas.

Rhuda difficilis, sp. n.

♀. Palpi and frons mottled brown and whitish buff; vertex, collar, and thorax brown ; a fuscous-brown shade on collar in front, partly edged with white; a fuscous-brown shade on thorax near collar; patagia shaded with lilacine. Abdomen dull smoky brown above, with yellowish hairs at base, underneath yellowish. Fore wings : base and inner margin broadly dark silky olive, with a whitish patch below median at base and some white and greyish irrorations at base of inner margin ; a velvety black basal line, outbent from cell to submedian and edged with whitish below cell; a darker olive-brown space on costal margin, its posterior edge shading to black, oblique from costa across cell, straight along vein 4 for half its length, upturned and slightly incurved on costa near apex ; a narrow white shade follows behind this space, crossed by a dark antemedial line on costa, and a subterminal line from vein 6–8, terminating in a black streak ; a broad roseate shade follows the white from cell to

vein 7 ; three fine brown postmedial lines below veins 4–2, and an angled line between 3 and 2 ; a postmedial black point on submedian and one below it ; the outer margin shaded with brown below vein 5 and with yellow above it, crossed from below vein 7 by an irregular fine black line ; terminal white points on veins ; the costal margin irrorated with white and with some fine black streaks ; a geminate fuscous postmedial line above vein 6. Hind wings fuscous brown ; the inner margin and cilia yellow ; a small postmedial yellowish patch between veins 2 and 5.

Expanse 65 mm.

Hab. Avangarez.

Blera modulata, sp. n.

♂. Palpi fuscous, fringed with grey ; head grey, mottled with brown ; collar mottled light and dark brown ; thorax dark grey-brown, tufted with white behind ; abdomen above dark brown, some greyish tufts at base, terminal segment white, thinly irrorated with brown, ventrally white. Fore wings dark greyish brown ; a white shade at base of inner margin ; a whitish-grey shade medially on inner margin ; a fine dark basal line ; antemedial fine, sinuous, black, inwardly angled on submedian ; outer line similar, incurved at vein 4 ; a subterminal white line, nearly straight from 9–5, then inset and outwardly oblique to below 4, inset on vein 3, and wavy to tornus, followed by a grey shade ; a marginal black line straight from apex to vein 4 and inwardly edged with white, followed by a terminal brown shade, below vein 4 lunular, followed by white. Hind wings white ; the veins outwardly and a terminal shade brown, with a white point at anal angle.

Expanse 34 mm.

The female only differs in having brown hind wings.

Expanse 37 mm.

Hab. Juan Vinas, Tuis.

Allied to *B. tenuis*, Schs. (♀ *costaricensis*, Dogn.).

Meragisa dejecta, sp. n.

♂. Head, collar, and thorax greyish green, a lateral black streak on palpi. Abdomen brownish, shading to grey, irrorated with dark brown on terminal segments ; the base with ochreous hairs. Fore wings green-grey ; a faint dark geminate line at base ; antemedial black, geminate, filled in with dark ochreous scales, finely wavily oblique from costa to median, obsolescent below cell, with a lunule above submedian and one outset below it, very indistinct ; a whitish

line on discocellular with a dark point and some ochreous scales, preceded by a white point on subcostal; a fine, indistinct, lunular, postmedial dark line, followed by geminate black lunules separated by ochreous scales, these lunules inwardly oblique from costa near apex, the one between 3 and 4 slightly outset; an irregular dark marginal line, forming oblique streaks from below vein 5; paired terminal black points; cilia yellowish white. Hind wings dull brownish black; the inner margin pale yellowish; cilia yellowish white.

Expanse 54 mm.

Hab. Juan Vinas.

Meragisa innoxia, sp. n.

♀. Head mottled olive-grey and fuscous brown. Collar and thorax dark olive-green, thinly streaked with whitish grey. Abdomen fuscous brown, the terminal segments whitish grey. Fore wings olive-grey; a black point at base of submedian and a fine geminate dark line, followed by a faint darker grey shade almost straight; the antemedial dark, geminate, oblique to median, inbent to submedian fold, twice outcurved below it, filled in with an indistinct whitish-grey shade from below cell; a black streak on discocellular and a dark line on costa above it, followed by a fine dark line, oblique and angled on costa, incurved to vein 3 and again to submedian; postmedial from costa towards apex, consisting of fine geminate black lunules separated by whitish scales, incurved to inner margin near tornus, the lunule between veins 3 and 4 outset; some darker grey shades follow the postmedial except between 3 and 4 and below submedian fold; a submarginal black line, interrupted by veins and inwardly edged with white, nearly straight from apex to vein 3, inset below 3 and 2; terminal outcurved lunules at end of veins. Hind wings dark lilacine brown; cilia pale yellowish, tipped with white.

Expanse 46 mm.

Hab. Juan Vinas.

This is the only *Meragisa* I know without the paired terminal points on fore wings.

Meragisa montana, sp. n.

♂. Palpi black, fringed and tipped with grey. Head and collar streaked with reddish-brown and grey hairs; thorax more uniformly paler grey. Abdomen dark brown, terminally mottled reddish brown and white, the base with long

lighter brown hairs. Fore wings grey, irrorated with brown; the antemedial line brown, geminate, wavily lunular, oblique to beyond middle of inner margin; some yellowish scales at base and traces of a faint basal line; some yellow and black scales on discocellular; postmedial oblique on costa, below vein 8 consisting of incurved lunules, the first line black, outwardly filled with ochreous scales, inwardly oblique from veins 7–4, outset between 4 and 3, then slightly oblique, the second line brown, outwardly shaded with grey, and also a brownish shade from veins 8–4; an irregular marginal black line and paired terminal points; the inner margin shaded with brown. Hind wings dull brownish black, with light brown hairs at base and along inner margin; cilia ochreous at base, shaded with fuscous and tipped with white. Fore wings below fuscous, the base, costa, and outer margin ochreous. Hind wings below ochreous; a broad subterminal fuscous shade.

Expanse 50 mm.

The female has the two postmedial lines black; the antemedial lines suffusing and shaded with black below cell.

Expanse 54 mm.

Hab. Poas, 7000 feet.

Meragisa siavina, sp. n.

♂. Head, collar, and thorax streaked grey and brown; abdomen dorsally ochreous on two basal segments, then brownish, the two terminal segments whitish, irrorated with brown; underneath yellowish buff. Fore wings grey, thickly irrorated with brown; the usual lines indistinct brown, geminate; a fine dark line on discocellular, faintly edged with white, preceded by a minute white spot below subcostal. Hind wings dull fuscous brown; some buff hairs on inner margin; cilia whitish buff.

Expanse 55 mm.

♀. Head and thorax greyer; the ochreous shade at base of abdomen faint. Fore wings: the base, costal margin, and outer space grey, more thinly irrorated with brown; the middle space dark brown behind; antemedial oblique from costa to median, geminate, fuscous brown, filled in with dark brown, sinuous and outwardly oblique below median, inwardly angled on submedian, fine, geminate, black; the line on discocellular black; a medial streak on costa above end of cell; a postmedial dark lunular shade, geminate and distinct on costa, only faintly indicated otherwise; subterminal fine, black, deeply lunular, geminate, filled in with brown, and

followed by brown shadings ; the marginal line very deeply incurved between the veins. Hind wings: the hairs on inner margin brown.

Expanse 58 mm.

Hab. Juan Vinas.

DOTTIA, gen. nov.

♂. Antennæ pectinated, but not to tips ; palpi extending beyond frons, third joint small; anal hairs bifurcating. Fore wings: a tuft of hair on inner margin ; 2 from beyond middle, 3 and 4 from lower angle ; 5 from above middle of discocellular ; 6 from areole towards base ; 7, 8, 10 from end of areole. Hind wings: veins 3 and 4 slightly apart ; 5 from near middle of discocellular ; 6 and 7 from upper angle ; 8 close to 7 to near end of cell.

Dottia effecta, sp. n.

♂. Palpi dark brown, fringed with lilacine brown. Head, thorax, and basal tufts on abdomen lilacine brown ; abdomen fuscous brown, anal hairs reddish brown. Fore wings brownish buff, darkest and tinged with lilacine to postmedial except between veins 2 and 4 ; a pale greenish streak at base on submedian fold and a fuscous streak at base of submedian, both terminating at inner line, which is dark brown, fine, geminate, dentate on costa and in cell, slightly outcurved between fold and submedian, and contains a small white spot above fold ; a dark brown line on discocellular, followed by a brown streak to termen between 5 and 6 and a shorter streak between 4 and 5 ; a fine brownish postmedial line angled beyond cell, lunular from vein 5 to inner margin, closely followed by another similar line, but which is more remote from vein 5 to costa ; terminal dark brown shades from vein 3 to tornus, with a white spot between 2 and 3 ; a smaller white spot between 5 and 6, cilia with dark brown spots at veins. Hind wings fuscous brown, an indistinct medial buff shade ; cilia yellowish, tipped with white ; a dark brown shade at anal angle, crossed by a whitish oblique line.

Expanse 46 mm.

Hab. Banana River.

Saturniadæ.

Ormiscodes flora, sp. n.

♂. Head and thorax dark reddish brown ; the patagia shaded with brown, some of the long hairs ochreous. Abdo-

men above black, underneath brown ; a lateral row of buff spots ; sublateral buff spots on segments 5 and 6. Fore wings : the basal third roseate, with an oblique dark brown shade from base of costa to inner margin ; the medial space dark roseate brown ; a large irregular yellowish-white spot at end of cell, containing an irregular brown spot divided more or less by a whitish line ; this discal spot is upright, and not oblique as in *O. pulchricornis,* Wlk. ; outer space lighter brown, with a subterminal greyish shade, followed by a roseate shade, leaving the termen from vein 2 below apex reddish brown. Hind wings brownish ; the outer margin narrowly tinged with roseate.

Expanse, ♂ 69, ♀ 89 mm.

Hab. Tuis, Juan Vinas.

Dirphia horcana, sp. n.

♂. Palpi, head, and thorax black, the collar and patagia faintly tinged with brown. Fore wings : the base narrowly and obliquely black from base of costa, followed by a whitish-grey space extending to middle of costa and inner margin in a sharp point, and narrow from within cell to submedian fold, streaked on costa with brown and outwardly shaded with brown, leaving a clear white terminal edge ; medial space black, faintly tinged with brown, limited by a straight white outer line ; a white line on median to discal spot, which consists of a large white oblique lunular spot containing an ochreous streak ; the terminal space whitish grey, shaded with brown ; a fine brown line follows the outer white line, and beyond it are black streaks except between veins 4 and 5 ; these streaks coalesce on costa and between veins 2 and 3. Hind wings ochreous red ; a black streak on discocellular ; a subterminal fuscous line ; a marginal reddish-brown shade, followed by a greyish shade on termen and cilia.

Expanse 78 mm.

Hab. Tuis.

Allied to *D. horca,* Dogn., and *D. subhorca,* Dogn.

Hylesia dalina, sp. n.

♂. Head, collar, and thorax lilacine brown. Abdomen bright ochreous brown, with fuscous shadings dorsally at base ; tarsi red. Fore wings lilacine ; an antemedial brown line inwardly oblique from costa ; a broad brownish streak on discocellular ; a broad postmedial brownish line, widest on costa and inwardly oblique ; a subterminal darker shade

slightly outbent at vein 4; a terminal darker shade from veins 7–3. Hind wings paler, tinged with buff; a faint darker line on discocellular; a subterminal narrow darker shade, followed by a fine indistinct dark line.

Expanse 44 mm.

Hab. Sixola.

Closely allied to *H. alinda*, Druce, but the lines do not converge on inner margin and the outer line is more remote from discocellular. Both species show considerable variation, but seem quite distinct.

Hylesia rubrifrons, sp. n.

♂. Palpi, frons, and hairs at base of antennæ dark red; collar and thorax dark lilacine brown; abdomen dark brown, dorsally banded with black and overlaid with ochreous hairs. Fore wings lilacine brown; the antemedial straight, dark brown, preceded by a narrow lilacine shade, and followed by a broader lilacine shade; the discal spot darker brown, followed closely by the broad darker brown postmedial, which is slightly oblique as in *H. alinda*, Dr., but is not followed by a pale lilacine shade; a subterminal lilacine shade from vein 5 to outer margin above tornus; a lilacine shade at apex. Hind wings lilacine; a brown spot on discocellular; a dark postmedial line, and a broad subterminal brownish shade.

Expanse 44 mm.

Hab. Tuis.

The fore wings are not falcate as in *H. alinda*, Dr., the lines are straighter, and the subterminal shade on hind wings is much broader.

Hylesia rufipes, sp. n.

♂. Palpi brown; head lilacine brown; thorax fuscous brown, mottled with lilacine-brown hairs; abdomen black above, laterally, below, and anal hairs red; thorax below and legs red. Fore wings roseate lilacine, the veins finely olive-brown; an antemedial olive-brown line, oblique on costa, upbent on subcostal to near discocellular, then nearly straight to inner margin, inwardly shaded below subcostal with fuscous brown, becoming wider to submedian fold; a large dark brown shade on discocellular; a fine postmedial dark shade suffusing at vein 4 with another line remote and outcurved on costa, heavily marked below vein 4; a terminal dark brown shade on costa; a subterminal shade parallel to outer line to vein 4, then outcurved between

4 and 3, and between 3 and 2, outbent below 2 to tornus; a terminal brownish shade from above vein 3 to vein 7. Hind wings roseate lilacine; the inner margin shaded with brownish hairs; a faint dark shade on discocellular; a dark postmedial line, and a subterminal fuscous shade. Hind wings below with a straight dark postmedial line from apex to inner margin, followed by a dentate fuscous shade; the termen from vein 3 to vein 6 reddish.

Expanse 41 mm.

Hab. Sixola.

Hylesia umbrata, sp. n.

♂. Head, collar, and thorax dark lilacine brown, the thorax streaked with ochreous hairs; abdomen ochreous brown. Fore wings dull lilacine; the base darker limited by a brownish line angled on subcostal, and faintly incurved below cell; a large dark shade at end of cell; the postmedial brownish shade broad, outcurved on costa, followed by a pale lilacine shade on costa, and throughout by a lilacine brown shade limited by the irregular subterminal, which is incurved between veins 6 and 4. Hind wings dull lilacine, broadly shaded with brown on inner margin; the discocellular and veins darkly streaked; a dark postmedial shade and faint subterminal line.

Expanse 49 mm.

Hab. Tuis, Sixola.

This species is nearest *H. approximans*, Wlk., and shows considerable variation in the intensity of the markings, but can be recognized by the broad postmedial shade.

Hylesia frigida, sp. n.

♂. Head, collar, and thorax black-brown; a few ochreous hairs on thorax; abdomen black dorsally, with a few scattered ochreous hairs, lateral and anal hairs ochreous. Fore wings lilacine, the veins brownish; an indistinctly darker basal shade; a broad dark shade, crossing end of cell and enclosing a fuscous line on discocellular, its inner margin nearly straight, its outer wider and slightly excurved on costa, then inwardly oblique; a darker subterminal shade, indistinct and irregular. Hind wings lilacine; the discocellular and veins darkly streaked; a subterminal darker and very indistinct shade.

Expanse 43 mm.

Hab. Volcano Turrialba, 5800 ft.

This species is apparently confined to the higher elevations.

Hylesia annulata, sp. n.

♂. Palpi light brown, streaked with dark brown behind; frons greyish brown, edged laterally with ochreous; collar and thorax black, with a few scattered hairs; abdomen dorsally black, subdorsally golden ochreous. Fore wings brownish grey; the inner line fuscous, inwardly shaded with greyish buff on costa, outbent in cell, limiting a light brown space in cell, inset below cell, deeply outcurved below submedian fold, and outbent below submedian, partly shaded inwardly with light brown, where crossing a fuscous shade which extends below cell, from near base to middle of wing; a large fuscous annular spot at end of cell filled in with light brown; the outer line fine dark brown, outwardly edged with greyish buff, indicated above vein 7 by a fine inbent dark line; the costa apically fuscous; an irregular subterminal brownish shade; the termen darker shaded and irrorated with olive-brown. Hind wings olive-grey; the cell and inner area shaded with fuscous; a fuscous line on discocellular, surrounded by a vague round shade; a fuscous postmedial line and rather broad subterminal shade; some ochreous-buff hairs on inner margin.

Expanse 56 mm.

Hab. Sixola.

Hylesia rosacea, sp. n.

♂. Head, collar, and thorax olive-brown; abdomen dark brown, covered with ochreous hairs. Fore wings roseate; a dark olive-brown streak at base of inner margin; the veins finely brownish on outer half; an oblique olive-brown spot on discocellular; a fine dark postmedial line; a marginal brownish shade from veins 7–3, reaching postmedial below vein 7, and tapering to vein 3 on outer margin. Hind wings roseate, darkest on inner margin; a fine postmedial dark line; a very faint postmedial fine shade. The apex of fore wing is produced and somewhat falcate.

Expanse 46 mm.

Hab. Sixola.

Hylesia hamata, sp. n.

♂. Palpi brown; head, collar, and thorax black, faintly tinged with brown; abdomen ochreous. Fore wings with the apex falcate, dark lilacine, the apical area shaded with fuscous; an oblique black streak from base of costa to inner margin; a fine faint darker line on discocellular; a fine dark postmedial line, followed by a less distinct fine subterminal

line. Hind wings dull dark lilacine; the veins and disco-cellular finely darker; brownish hairs on inner margin; an indistinct darker postmedial line.

Expanse 47 mm.

Hab. Tuis.

Near *H. acuta*, Druce.

Ceratocampidæ.

Othorene pollens, sp. n.

♂. Body light ochreous brown above, tinged with lilacine; abdomen underneath lilacine. Fore wings: the base and outer margin lilacine, the basal part limited by a fine black line, slightly curved, the outer margin by a fine black line from apex to inner margin at two-thirds from base; the medial area olive-brown; a small round white spot on disco-cellular. Hind wings dark red; the costal and outer margin broadly roseate brown; a large vague black spot at end of cell. Fore wings below: the base and discal area roseate; a large black spot at end of cell; the costa and apical space beyond cell light brown; a black line from costa close to apex to inner margin; the outer margin lilacine. Hind wings below lilacine; the inner margin broadly whitish buff; a faint subterminal dark line from costa to vein 5.

Expanse 75 mm.

Hab. Sixola.

Othorene talamanca, sp. n.

♂. Body above buff-brown, underneath whitish buff. Fore wings ochreous brown, with a few black striæ and irrorations; the base and outer margin tinged with lilacine, the former limited by a fine slightly curved black line, the latter by a line from costa at apex to inner margin; a small white spot at end of cell. Hind wings ochreous brown, the discal area and inner margin dark red. Fore wings below as in *O. pollens*, but the black spot at end of cell much smaller. Hind wings below whitish buff, thinly irrorated with black.

Expanse 78 mm.

♀. Fore wings dull brown, thickly irrorated with fuscous striæ; the medial area tinged with roseate; a vague darker shade at end of cell; the lines fine, dark brown, the outer line to middle of inner margin. Hind wings as in the male. Fore wings below brownish tinged with red on inner margin; a large black discal spot; black striæ towards apex and on outer margin. Hind wings below buff-brown, with coarse

black irrorations except on inner margin, which is broadly pale buff.

Expanse 97 mm.

Hab. Sixola, Tuis.

Othorene vilderi, sp. n.

♂. Body above light ochreous brown, the thorax tinged with lilacine. Fore wings ochreous brown between the lines; the base broadly lilacine, limited by a straight fuscous line; the outer space lilacine, limited by a dark line from costa near apex to vein 2 medially, then angled and outbent to inner margin; a white line on discocellular, expanding posteriorly into a triangular spot; some scattered dark striæ on costa and outer space. Hind wings dark red; the costal and outer margin roseate brown. Wings below similar to *O. talamanca*.

Expanse 76 mm.

Hab. Sixola.

This species, *O. pollens*, and *O. talamanca* were all taken in March at Sixola and may be aberrant forms of one species.

Adelocephala pacifica, sp. n.

♂. Head, collar, and thorax ochreous; abdomen whitish buff, tinged with ochreous dorsally. Fore wings ochreous, thinly irrorated with fuscous striæ; the base tinged with lilacine, limited by a brownish line, angled on subcostal; a round brown spot at end of cell; a fine brown line faintly sinuous from apex to inner margin beyond middle, beyond which the wing is slightly darker. Hind wings ochreous buff; the inner margin broadly red to beyond middle. The female is more thickly irrorated with fuscous; the discal spot indistinct; the hind wings darker and only faintly tinged with roseate on inner margin.

Expanse, ♂ 50 mm.

Expanse, ♀ 62 mm.

Hab. Avangarez.

Dalceridæ.

Anacraga rebella, sp. n.

Entirely lemon-yellow with a slight orange tint. Hind wings a little paler than the fore wings and somewhat translucent.

Expanse 13 mm.

One male, Banana River, Costa Rica, March 1907.

Similar in coloration to *Anacraga goes*, Schaus, though much smaller and not quite so vivid a yellow. The venation differs, the centre of the cell being well retracted, making the accessory cell and lower angle appear prominent, while in *goes* the end of the cell is not thus retracted, but nearly straight across.

Cossidæ.

Zeuzera comisteon, sp. n.

Head and collar dark grey-brown; thorax white; abdomen buff-white above, sometimes grey, laterally grey, underneath dark grey. Fore wings white, with transverse brownish streaks, rather widely apart; costa to near middle fuscous brown with black spots; costa beyond with black spots, the largest postmedially; cell for more than half from base brownish; a similar patch below end of cell; a brownish shade from within cell, along vein 4 to near termen emitting above and below thicker streaks; a terminal brownish patch between 6 and 7; terminal brown spots at ends of veins extending on to cilia. Hind wings greyish white, with faint grey striæ; the inner margin darker grey; terminal dark spots at end of veins.

Expanse 37–60 mm.

Hab. Sixola, Tuis, La Florida.

Psychonoctua terrafirma, sp. n.

♂. Head and collar mottled buff-brown, the latter edged posteriorly with grey; thorax mottled grey and brown, with dark brown tufts behind; abdomen grey. Fore wings buff-grey, with fine brown and black reticulations, the heaviest marked along inner margin; basal third of costa, cell space below it, and a shorter shade below cell dark brown shaded with black; a small black spot on discocellular. Hind wings buff-white; dark brown spots on cilia at end of veins.

Expanse 34–57 mm.

Hab. Sixola, La Florida.

Hemipecten gaudeator, sp. n.

♂. Palpi black, tipped with light brown; frons brown; vertex and collar in front black; collar otherwise and thorax white, thinly irrorated with black; abdomen grey to fuscous brown above. Fore wings whitish, thickly suffused with fuscous grey and brown, and crossed by dark grey striæ; a

narrow white space at base; a vague antemedial fuscous shade; a large buff-brown space on terminal area from veins 2–9, inwardly finely edged with dark velvety brown, above and below more broadly so, and outwardly broadly edged with reddish brown; this space contains a broad dark brown band, incurved from vein 8, and suffusing with brown outer margin between veins 4 and 5. Hind wings dark brown with indistinct dark reticulations; cilia light brown, spotted with dark brown.

Expanse 69 mm.

Hab. Tuis.

Hemipecten alfaræ, sp. n.

♂. Head, collar, and thorax whitish grey, thinly irrorated with black, some reddish brown on thorax posteriorly. Fore wings whitish grey, whitest on costal and inner margins; the costa medially finely dark grey, and with short downward grey striæ, and upward striæ from subcostal; the inner margin crossed by numerous brown lines, and others across middle of wing, but further apart, the medial and line at end of cell broader; the lines on postmedial area between 2 and 5 suffusing; a round velvety black-brown spot subterminally between 6 and 8, and a smaller dark brown spot nearer termen between 3 and 4; a narrow steel-grey terminal shade. Hind wings light brown.

Expanse 36 mm.

Hab. Tuis.

Named after Mr. Alfara, Director of the Museum in San José.

Givira amanosa, sp. n.

Palpi fuscous brown; frons buff; vertex and collar dark brown, the latter edged behind with lighter brown; thorax light brown, with dark lines and shadings; abdomen fuscous brown, with pale transverse lines. Fore wings: base brown; antemedial dark brown spots coalescing, the spot in cell more remote from base, outwardly edged with buff, and followed by buff-brown on costa and in cell, and a large olive-brown spot below cell; the median space constricted below cell, bifurcating on inner margin, brown, spotted with buff on costa; outer portion of wing below vein 5 dark brown, with three round light brown spots between 2 and 3, one near cell between 3 and 4, and also between 4 and 5; terminal light brown shades between 3 and 5, enclosing dark brown terminal spots at veins 3 and 4; light brown semilunar spots on inner margin; a broad dark brown space beyond cell from costa to

vein 5, followed by a narrow buff shade, and three small dark spots; the terminal space light brown, with a large subterminal irregular dark spot from costa to vein 6, emitting branches, of which two extend to vein 5; marginal buff lines, forming terminal spots. Hind wings fuscous brown, with darker spots medially below costa, and a broad postmedial shade, narrowing towards vein 2; pale marginal lines forming terminal spots.

Expanse 45 mm.

Hab. Tuis, Limon.

Givira morosa, sp. n.

Head, collar, and thorax mottled lilacine brown and violaceous black; abdomen buff-brown, irrorated with dark brown and black scales, the base and terminal segment violaceous black. Fore wings chiefly steel-grey, reticulated with black-brown; the inner margin narrowly, a basal shade below cell, a large shade about discocellular, and subterminal shade, except between veins 5 and 6, tinged with buff-brown; an inwardly oblique thick black antemedial line from median to vein 1 *b*; cilia with alternate fuscous-grey and brownish spots. Hind wings whitish, finely reticulated with brown; the inner margin broadly brownish; cilia grey-brown at base, terminally white interrupted by dark spots.

Expanse 37 mm.

Hab. Juan Vinas.

Givira fidelis, sp. n.

Head, collar, and thorax violaceous brown, irrorated with white; abdomen more reddish brown, irrorated with white. Fore wings: base, costal and inner margins, and median vein lilacine brown, crossed by darker brown striæ; a velvety black line along inner margin from near base to beyond middle; a space below cell and postmedial line to subterminal more thinly scaled fuscous grey, with short darker striæ across the veins; a subterminal black line, curved and parallel with termen; the outer margin silvery grey, with a few black streaks and a line before apex; cilia light reddish brown. Hind wings fuscous grey, thinly scaled in discal and postmedial area; some indistinct darker striæ; a greyish marginal shade below vein 2; cilia light reddish brown.

Expanse 33 mm.

Hab. Avangarez.

Givira tigrata, sp. n.

Palpi reddish brown; frons buff-brown; vertex and collar in front reddish brown; collar behind and thorax whitish buff, with transverse reddish-brown shades; abdomen light reddish brown, with transverse whitish-buff lines. Fore wings ochreous, crossed by reddish-brown spots and short thick lines partly edged with pale golden scales; some small basal spots followed by larger coalescing spots, darker below cell; three antemedial small spots, on costa, in cell, and below cell, and geminate spots above and below 1 *b*; a large medial darker spot across costa and end of cell, and a similar spot from below end of cell to inner margin, the two sometimes coalescing and forming a broad band; a broad postmedial line from 7–2, followed by short lines, and a broken subterminal; broad terminal streaks on outer margin down bent and outwardly oblique. Hind wings ochreous, with indistinct darker transverse striæ.

Expanse 30 mm.

Hab. Juan Vinas, Tuis.

Lentagena tristani, sp. n.

Head and thorax grey, streaked with brownish hairs; a darker brown-grey shade posteriorly on thorax; abdomen grey, banded with fuscous. Fore wings whitish, shaded with grey postmedially, and reticulated with fine darker grey lines; the costal margin, base of cell, inner margin, and apex shaded with brown; a fine brown streak on discocellular; a broad dark brown streak medially above submedian; reticulations on outer margin more heavily marked, dark brown; dark brown shades on cilia at end of veins. Hind wings semihyaline whitish grey; the margins, veins, and some striæ brown.

Expanse 39 mm.

Hab. Juan Vinas, Tuis, Sixola.

Named after Prof. Tristan, of San José, who has assisted greatly in a knowledge of the fauna of Costa Rica.

Trigena crassa, sp. n.

♂. Body mottled dark steel-grey and brown, the abdomen somewhat irrorated with white. Fore wings dark steel-grey, irrorated with light brown; a fine subbasal black line; a heavier marked antemedial line, bifurcating in cell, the inner line inbent towards inner margin; a fine postmedial line and a more distinctly marked subterminal line, thickening in places and emitting curved lines to termen; some whitish

mottlings on postmedial area from vein 3 to costa. Hind wings white; a broad fuscous shade from base to outer margin near inner margin.

Expanse 46 mm.

Hab. Sixola.

Closely allied to *T. parilis*, Schs.

Cossus infantilis, sp. n.

♂. Body fuscous brown, the collar and thorax mottled with white. Fore wings brown; a white spot on discocellular; a fine postmedial and subterminal fuscous-brown line, each emitting downwardly oblique branches; some greyish shadings on branches of subterminal. Hind wings fuscous brown.

Expanse 20 mm.

Hab. Esperanza.

Cossus nina, sp. n.

Head and thorax whitish grey, with some dark irrorations; Abdomen grey, palest on terminal half, and banded with fuscous. Fore wings grey; a whitish shade at end of cell and between veins 2 and 4; a few fine velvety black striæ, forming a medial line, which crosses a darker grey spot above inner margin; a postmedial line from vein 8 to tornus, followed by a subterminal line inbent from near apex to vein 5. Hind wings dark grey.

Expanse 33 mm.

Hab. Sixola.

Hypopta cinerea, sp. n.

Head and thorax brown, mottled with buff hairs; abdomen greyish buff, faintly banded with fuscous. Fore wings greyish buff, thickly covered with brownish striæ; subterminally a small brownish spot between 4 and 5, and 6 and 7, both very indistinct, geminate darker spots at end of veins; cilia dark brown, with faint intervenal greyish-buff spots. Hind wings similar; the inner margin broadly brownish.

Expanse 35 mm.

Hab. Sixola.

Cossula albicosta, sp. n.

Body brown, thickly mottled with white hairs, giving it a grey appearance. Fore wings: the costal margin to near apex whitish, crossed by a few dark striæ near base; the inner margin finely white to beyond middle; space below

cell and vein 2 brown, crossed by whitish-buff striæ; cell and outer space above vein 2 dark grey, becoming whitish on termen, and crossed by darker grey striæ; vein 2 entirely, veins 3–6 terminally white; cilia olive-brown tipped with white. Hind wings thinly scaled, grey, with darker striæ; the termen finely and cilia at base olive-brown; the margin greyish buff.

Expanse 35 mm.

Hab. Juan Vinas, El Sitio.

Cossula? cærulescens, sp. n.

Palpi crimson; frons reddish brown; vertex and collar velvety black; thorax silky steel-black; abdomen black, tinged with dark blue; anus crimson; thorax below crimson; legs black. Fore wings silky steel-black, with velvety black streaks, chiefly across costal and inner margins; a velvety black patch across middle of cell, extending slightly below it, a broad subterminal dull black band from vein 9, curving to outer margin between 4 and 5, inwardly shaded with red, and followed by a broader red shade crossed by a black line. Hind wings dark silky blue; the cilia partly white; wings below dark silky blue; the outer margin of fore wings with irregular red markings.

Expanse 64 mm.

Hab. Tuis, Juan Vinas.

Psychogena, gen. nov.

Antennæ dentate, with short bristles; legs and tarsi with ridges of long hairs above; abdomen long and slight; lateral tufts of hairs on terminal segments. Fore wings long and narrow, the outer margin oblique; vein 2 just beyond middle of cell; 3 near end of cell; 4 and 5 separate; 6 from near upper angle; 7 and 8 stalked; 9 and 10 free. Hind wings triangular, the outer margin incurved; the anal angle produced; 2, 3, 4, and 5 apart; 6 and 7 stalked.

Psychogena miranda, sp. n.

♂. Palpi, vertex, collar, and patagia black; frons and thorax dark brown; abdomen dorsally brown, laterally black, terminally mottled with buff-white. Fore wings dull light brown; the base rather broadly black, expanding on inner margin, and crossed by an irregular basal brown line; black reticulations on costa, inner margin, subterminal area, and medially, and a large black spot medially below vein 2; a

large black spot at and beyond end of cell reaching costa ; the apex broadly brown-black, the outer margin more narrowly so ; terminal light brown spots between the veins. Hind wings black, faintly tinged with brown.

Expanse 37 mm.

Hab. Tuis.

Psychidæ.

Platœceticus costaricensis, sp. n.

♂. Body and wings fuscous grey, tinged with brown, especially on basal two-thirds of fore wings, the veins darkest. Veins all present; 4 and 5 on fore wings on long stalk, shortly stalked on hind wings.

Expanse 34 mm.

Hab. Juan Vinas, Cachi.

LXXIV.—*Seven new Asiatic Mammals, with Note on the "Viverra fasciata" of Gmelin.* By Ernst Schwarz.

In preparing a revision of the Indian Viverridæ, I have recently had occasion to examine a number of specimens in various Museums. Among them I found several new species, the first of which is

Paradoxurus celebensis, sp. n.

A Paradoxure of the *P. javanicus*-group, most nearly allied to *P. javanicus*, but coloured somewhat like *P. setosus* of Ceram.

Skull much as in *P. javanicus*; rostrum shorter and narrower; intertemporal constriction shorter and less deep. Brain-case very narrow, especially behind. Bullæ similar to those in *P. javanicus*, wide apart, but much smoother, much smaller than in *P. setosus*, not inflated between carotic canal and *foramen lacerum posterius*. Opening of posterior nares long and narrow as in *P. setosus*. Cheek-teeth similar to those of *P. javanicus*, somewhat smaller and less complex, protocone and metacone of p^4 strongly developed.

Back golden yellow, suffused with black and with three very faint longitudinal black lines. Limbs black and also tail except at the base and the white tip. Black face-markings reaching back behind the eyes, sharply distinguished

from the narrow whitish frontal band. Occiput black and sharply defined from the light frontal band, so differing from the majority of specimens of *P. javanicus*, where the light frontal band is very broad and gradually passes into the grey occiput.

Dimensions of type (measured on the mounted skin) :—

Head and body 505 mm. ; tail 405.

Skull : basilar length 101 ; zygomatic breadth 58 ; width of brain-case at squamosal 35·2 ; palatilar length 46·8 ; mastoid width 37 ; intertemporal constriction 17 ; length of upper tooth-row from front of c to back of m_2 (alv.) 40·5 ; p_4, length 8·5, greatest oblique diameter 10·1.

Type. Old male. Dresden Museum : No. B 1568 (mounted skin) ; B 1534 (skull) ; (old catalogue No. 2086) ; from Messrs. Ribb and Kühn.

Type locality. Bonthain, S.E. Celebes.

Paradoxurus cochinensis, sp. n.

A small species related to *P. hermaphroditus* of Siam, but with a different skull and dentition.

Skull with very short intertemporal constriction as in *P. milleri* from Tioman. Bullæ very short, rounded in front, and inflated between carotic canal and *foramen lacerum posterius*. Cheek-teeth small. P^4 complex ; postero-internal ledge narrow, paracone rather small.

Upper parts light silvery grey with a slight reddish hue. Three narrow dark brown longitudinal stripes, clearly made up of coalescing spots. Light frontal band narrow, sharply distinguished from the dark occiput. Limbs, terminal three-quarters of tail, chin, and throat brown. Underfur dark brownish. ("Type specimen.")

In a specimen from Nhatrang, Annam, in the British Museum, and in another from Song-Coy, district of Moy, Annam, kindly lent by Prof. Trouessart of Paris, the colour is entirely different, although in the Paris specimen the skull is like the type skull ; the Nhatrang skull is too young for comparison. I append the description of the Paris specimen, which is very similar to the Nhatrang one :—

Upper parts an indefinite whitish yellow, with five longitudinal rows of black spots. Limbs and tail, except at the base, black. Style of markings as in the type. Underfur dark greyish brown. The identity of these apparently very different colour-phases, which are not quite uncommon in Paradoxures, is proved by the skull above described.

Skull (of type) : basilar length 91 mm. ; zygomatic

breadth 56·5 ; width of brain-case at squamosal 35 ; palatilar length 45 ; mastoid width 34; intemporal constriction 12 ; length of upper tooth-row (c–m_2) 36 ; p_4, length 8 ; greatest oblique diameter 9.

Type. British Museum, no. 78. 6. 17. 13.

Type locality. Saigon, Cochin China.

Three specimens examined.

Paradoxurus exitus, sp. n.

A small species, very nearly related to *P. cochinensis,* of which it is a local representative, but with a slightly different skull and dentition.

Skull similar to that of *P. cochinensis* from Cochin China and Annam but smaller. Brain-case becoming narrower anteriorly, and gradually passing into the intertemporal constriction, which is not sharply set off as in *P. cochinensis.* Bullæ short, rounded in front, and strongly inflated between carotic canal and *foramen lacerum posterius,* as in the last species. P_4 with the paracone reduced as in *cochinensis,* but with much shorter metacone and better developed postero-internal ledge.

From *P. philippinensis,* which resembles it superficially, it is distinguished at once by the structure of the p_4 and the inflation of the bulla between the carotic canal and the *foramen lacerum posterius.*

Type. Old female. Royal Zoological Museum, Berlin. Original no. 17. Collected by Mr. Lehmann.

Measurements of skull (of type) :—

Basilar length 84 mm. ; zygomatic breadth 55 ; width of brain-case at squamosal 34 ; palatilar length 43 ; mastoid width 33·6 ; intertemporal constriction 12·5 ; length of upper tooth-row (c–m_2) 35 ; p_4, length 7·5, greatest oblique diameter 9.

Type locality. Fumui, east of Canton, China.

Specimens examined : one, the type, skeleton only.

This is the first record of a true *Paradoxurus* from the mainland of China.

Arctictis pageli, sp. n.

Distinguished by the shape and size of its cheek-teeth and bullæ. External characters as in *A. binturong.*

Skull more delicate than in *A. binturong,* with short and broad palate. Bullæ wide apart, narrow, with a sharp longitudinal edge above, and not inflated between carotic canal

and *foramen lacerum posterius*. Profile of skull as *A. binturong*. Cheek-teeth extremely reduced, small, and rounded. P_4 rounded, with a very small protocone; m_1 much smaller than p_4, with the inner half much narrower than the outer.

A. pageli differs as much from *A. binturong* (Raffl.) from Further India, Malay Peninsula, Sumatra, and Java, as it does from *A. whitei*, Allen, from Palawan (photographs of which have been kindly forwarded by Prof. J. A. Allen, of New York). In *A. binturong* (type locality: Malacca) the bullæ are strongly inflated between carotic canal and the *foramen lacerum posterius*; in the specimens of *A. whitei* available for examination the occipital region is broken, so that a comparison of the bullæ is impossible. But the differences in the structure of the cheek-teeth are evident enough, and show the distinctness of the three species. In *A. binturong* p_4 is distinctly triangular; in *A. whitei* it is obtusely oval (or better pentagonal) and much broader than long; in *A. pageli* it is very obtusely triangular and much reduced.

Dimensions of type :—

Head and body 960 mm.; tail 890. (Taken from the dried skin.)

Skull: basilar length 120; zygomatic width 77·5; mastoid width 54·1; palatilar length 69·5; intertemporal constriction 36; length of upper tooth-row (c–m_2) 40; p_4, length 7·5, greatest oblique diameter 7·9.

Type. Female adult. Royal Zoological Museum, Berlin: A. 85. 10. 49. Collected by Dr. Pagel.

Type locality. Sandakan, N. Borneo.

Specimens examined from La Datu, N. Borneo, and from Sarawak.

Viverricula pallida taivana, subsp.

An insular representative of *Viverricula pallida*, Gray, from Southern China, chiefly distinguished from it by its shorter coat, more definite markings, brighter ground-colour, and smaller, quite differently shaped bullæ.

Pelage much shorter than in *V. pallida*, but still longer than in *V. malaccensis* or *rasse*. Consequently the markings are much more distinct. Ground-colour of upper parts about Ridgway's "cream-colour," whereas in *V. pallida* it is somewhere between "ochraceous buff" and "buff." Longitudinal dorsal stripes "seal-brown"; neck suffused "cream-colour" and "seal-brown"; chin white. A dark transverse stripe on throat usually present. Chest blackish brown; belly dirty

yellowish. Hands and feet blackish brown. Tail with nine very narrow blackish-brown rings and as many whitish ones, including the long pure white tip.

I had long suspected the Formosa "Rasse" to be a separate form, but only now describe it from a good series of specimens in the Berlin Museum. I am much indebted to Prof. Matschie for the privilege of describing this form, which he himself had recognized to be new, when the specimens arrived at Berlin.

Dimensions of type (taken from the dried skin):—

Head and body 670 mm.; tail-vertebræ 350; hind foot 8.

Skull: basilar length 96; zygomatic width 49; mastoid width 34; palatilar length 49·5; length of upper tooth-row (c–m_2) 39; intertemporal constriction 13·4; distance of bullæ from one another (anteriorly) 11.

Type. Male, old. Royal Zoological Museum, Berlin: no. A. 243. 10. Original no. 26512. Collected by Mr. H. Sauter.

Type locality. Teraso, Formosa.

Eleven specimens examined, all from Teraso.

On *Viverra fasciata*, Gmelin.

Gmelin's description of *Viverra fasciata* (Syst. Nat. vol. i. p. 92, 1788) was based on the description and figure of an animal called "Le Chat Sauvage à bandes noires des Indes" by Sonnerat in his 'Voyage aux Indes Orientales et à la China' (vol. ii. p. 143, pl. 90) (Paris, 1782). The description and figure clearly show that it is the species now usually called *Galidictis striata* (Desm.). In his 'Mammalogie' (1820), Desmarest changed the name into *Viverra striata* without any reason, quoting Sonnerat and Gmelin in the synonymy. In the same work he used the name *Viverra fasciata* himself, but in quite another sense, applying it to an animal which can now be identified with the *Paradoxurus* of southern Malay Peninsula, for which it is very suitable, but unfortunately cannot be used, being preoccupied as shown above. The fact that Sonnerat's "Chat Sauvage" was stated to be from India is of no importance, as the same expedition procured other animals from Madagascar.

Galidictis fasciata (Gmelin), 1788.

Syn. *Chat Sauvage à bandes noires des Indes*, Sonnerat, *l. c.* (1782) (figured).

Le Putois Rayé de l'Inde, Buffon, Hist. Nat. Suppl. vol. vii. p. 231 (same figure as Sonnerat's, but uncoloured) (1788).

Viverra fasciata, Gmelin, *l. c.* (1788).

Viverra striata, Desmarest, *l. c.* p. 210 (1820).

Galidictis striata (Desm.), auct.

In working out a collection of Mammals from the Malay Archipelago, brought together by Dr. J. Elbert, the following two species have been found to need description :—

Sciurus elbertæ, sp. n.

A pale-coloured member of the *Sciurus leucomus*-group.

General effect of upperside between "olive" and "raw umber" (Ridgway), with a creamy-buff tinge on head; hairs with narrow blackish and broader pale rings of a shade nearly approaching "Naples yellow" No. 2 or 3 ('Répertoire des Couleurs'). Underside "ochraceous buff" (Ridgw.), in a second specimen between "ochraceous buff" and "ochraceous." Hands, feet, and sides of muzzle "cream-buff." Tail more brownish than back, diffusely blackish at tip. Tips of long tail-hairs "creamy white" 'Répertoire des Couleurs'). Underfur "olive-grey" (Ridgw.).

Skull. Rostrum short and nearly parallel-sided; nasals narrow behind, suddenly broadening anteriorly, and strongly convex transversely. Compared with a skull of *S. mowewensis*, Roux, from Bau-Bau, Buton, the palate is much narrower, the teeth smaller but similar in structure. Opening of posterior nares broader and with a distinct median spine which is absent in *mowewensis*. Bullæ smaller and narrower.

Measurements of skull (type) :—

Palatilar length 14·5 mm.; palate, breadth outside m_1 9·6; least width of rostrum 7; nasals 10·6 × 6·6; breadth across postorbital processes 20·9; mandible (alveolar point to condyle) 23; length of upper tooth-row 7·9, of lower tooth-row 8.

Type. Senckenberg Museum, Frankfurt-a.-M.: no. 721. Original number 227. Collected by Dr. J. Elbert.

Type locality. Eempuhu, East Kabaëna.

Two specimens examined.

Apart from its small size, this handsome squirrel is at once distinguished by its pale colour. It gives me great pleasure to associate with it the name of Mrs. Elbert, who accompanied her husband during his expedition.

Acanthion sumbawæ, sp. n.

Smaller than *A. javanicum* and with a very different skull.

Externally very much like *A. javanicum*, somewhat paler on neck and anterior portion of back, the brown with a slight purplish hue. Spines of posterior back with more black, usually with black or very short white tips.

Skull. Squamosal region of brain-case narrower when

compared with *A. javanicum*, intertemporal constriction well-marked, orbital region wider ; rostrum conical, much broader than in *A. javanicum*, its lateral outline gradually passing into that of the zygoma. Nasals narrower anteriorly, only broadening at their posterior end. When viewed in profile, the zygomatic process of the maxillary is seen to be placed more vertically, and to be shorter and broader. Lambdoid crest rising in a straight line, not bent backwards. Infra-orbital foramen much smaller and more oval, not so distinctly triangular as in *A. javanicum*. Outline of occiput trapezoid, not inflected below as in *A. javanicum*, as the paroccipital processes are very broad and long, their tips depending somewhat below condyle, whereas in *A. javanicum* they are in a line with it, or even above that line. Zygoma much narrower, so partly causing the shape of the infraorbital foramen described above. Opening of posterior nares narrower. Posterior portion of palate narrower, anterior portion shorter and broader than in *A. javanicum*. Bullæ very much flatter. Lateral margins of basioccipital not curved as in *A. javanicum*.

Skull measurements of type :—

Basal length 98 mm. ; occipito-nasal length 109; length of frontals 37 ; length of parietals 34 ; length of nasals 39·5 ; breadth of nasals anteriorly 19 ; breadth of nasals posteriorly 25 ; palatal length 51 ; palatal width (inside m_1) 8 ; width of zygomatic arches (sutura zygomatico-maxillaris) 56·5 ; width of zygomatic arches (greatest) 60 ; interorbital width (lacrymal) 44 ; interorbital width (proc. postorb.) 40·5 ; intertemporal constriction 36 ; length of bulla 18 ; diastema 30 ; length of upper tooth-row (alv.) 24 ; distance of tips of paroccipital processes from each other 41 ; "upper" breadth of occiput 20·5 ; distance from basion to highest point of occipital crest 31.

Type. Old female. Senckenberg Museum, Frankfurt-a.-M.: no. 833. Original number 301. Collected by Dr. J. Elbert.

Type locality. Dompu, Sumbawa.

This species is readily distinguished from *A. javanicum*, its geographical neighbour, by the different shape of the occiput, its flat bullæ, and smaller size. Photographs of the skull will be published later, together with a complete list of Dr. Elbert's collections.

In compiling these notes I have been most liberally assisted by Mr. O. Thomas, London ; Prof. Matschie, Berlin ; Prof. Trouessart, Paris ; Prof. Allen, New York ; and Prof. Jacobi, Dresden. I gladly take this opportunity to thank them most heartily.

LXXV.—*Six new Fruit-bats of the Genera* Macroglossus *and* Syconycteris. By Knud Andersen.

I. *The Species and Subspecies of* Macroglossus.

All known forms of *Macroglossus* are referable to two species, *M. minimus* and *M. lagochilus*. In the former the nares are directed more outward than forward, and the median vertical groove on the upper lip (the continuation of the internarial groove) is obsolescent or absent; in the latter the nares are directed half outward, half forward, and the median vertical groove on the upper lip is sharply defined. *M. minimus* ranges from Java eastward to Timor, west and north-westward to Sumatra, the Malay Peninsula, Siam, Burma, and Darjeeling. *M. lagochilus* covers the whole of Austro-Malaya (thus far no record from the Gilolo group) and extends west to the Philippines and Borneo. The two species appear nowhere to occur together.

The name *M. minimus*, as hitherto understood, covers two distinct forms. In the one (*M. m. minimus*) the rostrum is, both absolutely and relatively, shorter, being slightly less than one-third of the total length of the skull, and all measurements (skull, tooth-rows, external dimensions) average conspicuously smaller; in the other (*M. m. sobrinus*, subsp. n.) the rostrum is longer, slightly more than one-third of the skull, and all measurements average larger. The former (*minimus*) is, so far, known with certainty only from Java (including Madura) and Kangean Islands, and is probably the truly indigenous Javan race of the species, whereas the latter (*sobrinus*) may be presumed originally to have been confined to S.E. Asia, whence (as soon as altered physical conditions favoured an extension of its area south-eastward) it has spread to Sumatra and Java; even now the predominant form in Java seems to be *minimus*. Since *sobrinus* (if this hypothesis is correct) has spread south-eastward to Java, it is by no means unlikely that *minimus* has extended its range westward to Sumatra and, perhaps, to the Malay Peninsula, but as yet there is no conclusive evidence that such is the case.

A line drawn north–south between the Moluccas and New Guinea divides the area inhabited by *M. lagochilus* into a western and eastern half. The islands of the western half—viz., Borneo, the Philippines, Sanghir Islands, Celebes, and the Amboina group—are occupied by one race (*M. l. lagochilus*) in which the premolars and molars are not more reduced in breadth than in *M. minimus*; those of the eastern

half—viz., Mysol, New Guinea, the Bismarck Archipelago, Key, Aru, Torres Straits, and Solomon Islands—by three races (*M. l. nanus*, *pygmæus*, and *microtus*; the two latter new), which, all taken together, are characterized, as against *M. l. lagochilus*, by still narrower cheek-teeth, and distinguishable from each other by average differences in the length of the rostrum or size of the ears.

The new forms may be briefly diagnosed as follows :—

Macroglossus minimus sobrinus, subsp. n.

Averaging conspicuously larger than *M. m. minimus*, and with relatively longer rostrum. Skull, lambda to gnathion 28·5–29·5 mm. (in *M. m. minimus* 24·8–27·5), rostrum, orbit to nares 9·5–10·5 (7·8–8·8), forearm 42–48·5 (40–44·5).

Type. ♀ ad. skin with skull, Gunong Igari, Perak ; March, 1898; presented by A. L. Butler, Esq., B.M. 98. 11. 29. 1.

Total number of specimens examined, twenty-six (compared with forty of *M. m. minimus*).

Macroglossus lagochilus pygmæus, subsp. n.

As *M. l. nanus*, but rostrum relatively a little shorter, from orbit to nares 6·8 mm. (against 7·5–8·5 in *nanus*).

Type. ♂ ad. al. with skull, Mer, Murray Is., Torres Straits, presented by Professor A. C. Haddon, B.M. 99. 9. 10. 1.

Two specimens examined, both from Murray Is.

Macroglossus lagochilus microtus, subsp. n.

Similar to *M. l. pygmæus*, but ears relatively smaller; length from orifice 11–12·5 mm. (in *nanus* and *pygmæus* 12·5–13·5), breadth of flattened ear 8–8·5 (9–9·5).

Type. ♀ ad. al. with skull, Aola, Guadalcanar, Solomon Is., collected by C. M. Woodford, Esq., B.M. 88. 1. 5. 14.

Three specimens examined, from the islands of Florida and Guadalcanar.

II. *The Species and Subspecies of* Syconycteris.

Seven recognizable forms, referable to three closely related species, are now known, viz., *S. crassa* (with five local races), *australis*, and *naias* (sp. n.). In *S. crassa* the cheek-teeth are elongate in transverse section (p^4, m^1, p_4, and m_1 more than half as broad as long), and m^2 and m_3 are always present (cheek-teeth $\frac{5}{6}$) ; the species ranges over the whole of the

Amboina and New Guinea groups of islands, except Woodlark Is. In *S. australis* (Queensland) and *S. naias* (Woodlark Is.) the cheek-teeth are linear (as in *Macroglossus*; p^4, m^1, p_4, and m_1 only half as broad as long). The former is in every other respect similar to the New Guinea race (*papuana*) of *S. crassa*, whereas *S. naias* differs by having lost the small posterior molar above and below (cheek-teeth $\frac{4}{5}$).

The five subspecies of *S. crassa* differ from each other only in general size or in the length of the tooth-rows. Specimens from New Guinea and the Aru Islands (*S. c. papuana*) are of medium size; those from the Key Islands (*S. c. keyensis*, subsp. n.) have somewhat shorter tooth-rows, those from the Bismarck Archipelago (*S. c. finschi*) average a little smaller; finally, east (Trobriand and D'Entrecasteaux Islands: *S. c. crassa*) and even more so west (Amboina group: *S. c. major*, subsp. n.) of New Guinea the size of the animals is noticeably increased, though not more so but that there is still no absolutely hard-and-fast line between *papuana* and *crassa*, nor between *crassa* and *major*.

Subjoined brief preliminary diagnoses of the new forms:—

Syconycteris crassa keyensis, subsp. n.

Similar in every respect to *S. c. papuana*, except for the slightly shorter tooth-rows: c–m^2 (crowns) about 7 mm. as against 7·6–8·8 in *papuana*.

Type. ♂ ad. al. with skull, Key Is. (purchased), B.M. 99. 12. 4. 2.

Two specimens examined, both from Key Is.

Syconycteris crassa major, subsp. n.

As *S. c. crassa*, but averaging conspicuously larger. Skull, total length 28·8–29·8 mm. (25–28·8 in all other forms of the species taken together), c–m^2 (crowns) 8·8–9·7 (7–8·8), forearm 46–49 (39–47).

Type. ♂ ad. al. with skull, Amboina, presented by F. Muir, Esq., B.M. 10. 7. 25. 1.

Five examples examined, from Amboina and Ceram.

Syconycteris naias, sp. n.

As *S. australis*, with the cheek-teeth as narrow (linear) as in that species, but m^2 and m_3 absent.

Type. ♀ ad. al. with skull, Woodlark Is., collected by A. S. Meek, B.M. 96. 11. 5. 29.

LXXVI.—*A new Unstalked Crinoid from Christmas Island.*

By Austin Hobart Clark.

While visiting the British Museum recently I found among the collections there a curious little comasterid which had been obtained at Christmas Island. I urged Professor Bell to describe it in order that I might mention it in my report upon the 'Investigator' crinoids, but with his characteristic generosity he suggested that it would be more fitting were I to do it, as I had become so deeply engrossed in the study of these animals.

This little comasterid represents a new species of the genus *Comissia*, a genus including eight species, occurring from South-eastern Africa to Ceylon and thence eastward to the Philippine Islands, all of which have been described since the publication of the 'Challenger' report.

The species of the genus *Comissia* never have more than ten arms; the cirri are always numerous and well-developed, and the distal cirrus segments always bear spines or tubercles on the dorsal surface, this serving to differentiate them at once from the species of *Comatula* and *Cominia*, the cirri of which are invariably smooth.

Comissia has no very close relatives in the East Indian region, though it falls in the same subfamily, Capillasterinæ, as *Capillaster* and *Comatella*, but in the West Indies it is represented by the allied *Leptonemaster* and *Comatilia*.

The species of *Comissia* are all sublittoral, occurring between 17 and 100 fathoms; though none of them inhabit water of any great depth, none have ever been found at the surface.

The new form described below differs somewhat abruptly from all the others in the genus in the great length of the teeth of the comb on the earlier pinnules, and by the large proportion of pinnulars occupied by the comb. It may be described as follows:—

Comissia pectinifer, sp. n.

Description.—Centrodorsal moderately large, with a moderately large flat dorsal pole and three closely crowded marginal rows of cirrus sockets.

Cirri xxxiv. 14–16 (usually 16), 14 mm. long; the eighth is a transition segment; the longer proximal segments are nearly twice as long as broad, slightly constricted centrally;

the two segments preceding the penultimate are squarish to one-third broader than long; the outer segments (beyond the transition segment) are very highly polished and bear small dorsal tubercles.

The ten arms are about 90 mm. long; the elements of the IBr series appear in external view to be united by syzygy, and are well separated laterally; the arms resemble those of *Comissia lütkeni*; the brachials overlap rather strongly. The distal intersyzygial interval is usually three oblique muscular articulations.

P_1 to p_4 provided with combs; p_1 is about 12 mm. long, and has a comb with about twenty-five exceptionally long teeth; the comb of p_4 has fifteen or sixteen teeth, beyond which extends a toothless tip; only nine segments of p_4 are not supplied with teeth.

Hab. Christmas Island; the type is in the British Museum.

The other known species of the genus *Comissia* are :—

Comissia ignota, A. H. Clark: Amirante Islands; 17 fathoms.

Comissia peregrina (Bell): Macclesfield Bank; 55–60 fathoms.

Comissia lütkeni, A. H. Clark: Philippine Islands; 49–74 fathoms.

Comissia dumetum, A. H. Clark: Philippine Islands; 58 fathoms.

Comissia hispida, A. H. Clark: Philippine Islands; 51 fathoms.

Comissia horridus, A. H. Clark: Philippine Islands; 58 fathoms.

Comissia scitulus, A. H. Clark: Philippine Islands; 58 fathoms.

Comissia sp. (figured, as a ten-armed specimen of *Comanthus parvicirra*, in Chadwick, 'Rep. Ceylon Pearl Oyster Fisheries,' Part ii., Supplementary Report xi., plate, fig. 13): Ceylon; about 100 fathoms.

BIBLIOGRAPHICAL NOTICE.

A Swedish Expedition to Kilimanjaro.

Wissenschaftliche Ergebnisse der Schwedischen Zoologischen Expedition nach dem Kilimandjaro, dem Meru und den Umgebenden Massai-steppen, Deutsch-Ostafrikas, 1905–1906, *unter Leitung von Prof. Dr. Yngve Sjöstedt.* Band I. Abteilung 1–7, pp. 848, 31 plates; Band II. Abteilung 8–14, pp. 844, 19 plates; Band III. Abteilung 15–22, pp. 636, 37 plates. Stockholm: Palmquist's Aktiebolag, 1910.

Dr. Yngve Sjöstedt, of the Stockholm Natural History Museum, after his return from a short zoological excursion in West Africa, was inspired with an intense desire to make a detailed zoological survey of the mightiest African mountain and the surrounding district. A patriotic Swede, Herr Gustaf Palmquist, generously provided all the necessary funds, and in April 1905 Dr. Sjöstedt left Stockholm for Africa, accompanied by his taxidermist. He landed again in Sweden in August 1906 with enormous collections of almost every class of animal; some idea of the size of the collections is given by the following statistics:—they formed 137 coolie loads, and comprised 59,000 specimens, referable to 4300 species, of which 1400 were new to science.

The results of a study of these collections are set forth in three large volumes. Each volume is made up of several Abteilungen, most of which again are subdivided into memoirs, which were issued separately in 1907–1910. There are no fewer than eighty-five of these memoirs, contributed by a cosmopolitan array of sixty zoologists. Dr. Sjöstedt, besides writing a "Vorwort," is responsible for eleven of these memoirs, viz. those dealing with Aves, Œstridæ, Odonata, Termites, Orthoptera (5), Crustacea Decapoda, and an interesting account of "myrmecophilous" Acacias. In the "Vorwort" a general account of the faunas of the different areas visited is given. Dr. Sjöstedt divides Kilimanjaro into the following zones:—(1) The steppes or prairies, 750–1000 m.: the Masai dwell and herd their cattle in this region, which is, moreover, a perfect paradise for the big-game hunter. (2) The cultivated zone, extending up to 1900 m., inhabited by Bantu negroes, with their plantations of bananas, beans, and millet. (3) The rain-forest, 1900–3000 m. (4) Mountain plateaux (Bergwiesen), 3000–4400 m. (5) High alpine zone, extending from 4400 m. to the summit. Dr. Sjöstedt, who claims that he is the first zoologist to reach the snowfields of Kilimanjaro, found at the border of the snow (5500 m.) a *Collembola* living under stones and a Lycosid spider, which he suggests lives on "Wintermücken." Large collections were also made on the neighbouring Mt. Meru, and the caves at Tanga near the coast were explored.

Dr. Einar Lönnberg describes the mammals, reptiles, batrachians, and fishes. Only three new species of mammals were obtained—a bat and two hyenas,—but about half a dozen new local races or

subspecies are described, amongst them the Kilimanjaro lion. Lions abounded in the steppe-zone, but only two examples were shot, and one of these was diseased, its nasal cavity being filled with Pentastomids and Nematodes. Concerning the very asymmetrical skull of a giraffe with large exostoses on the right side and the right ossicone much thicker and shorter than the left, Dr. Lönnberg makes the interesting suggestion that the asymmetry was brought about by the giraffe always butting with the right side of the head. A very similarly deformed skull has been obtained by Major Powell-Cotton in S. Lado. Considering that thirteen bird-collectors have visited Kilimanjaro, Dr. Sjöstedt did well to find seventy-five species new to the district, three new species and one new subspecies; his bionomic notes are full of interest to the ornithologist. It was, of course, amongst the Invertebrata that the largest haul of new species was made, and the great majority of these are insects. The adult of one of the three Œstrid larvæ which infest the East-African rhinoceros was successfully bred, and proves to be a new species, *Spathicera meruensis*; it is interesting to note that this fly is a good mimic of a large Sphegid wasp, as was noted by Mr. S. A. Neave in N.E. Rhodesia. Dr. Sjöstedt neglected no method whereby his collections might be increased: on setting fire to the grass in the prairie zone he observed hundreds of insects fleeing before the flames and smoke; amongst them were numerous Phasmidæ, which, on account of their cryptic habits and appearance, had till then defied the closest scrutiny of the collector. One of the most interesting memoirs is that in which the peculiar growths on acacia-trees inhabited by ants are discussed. Dr. Sjöstedt believes that the ants have nothing to do with the production of the "galls," but that they have merely taken advantage of strictly normal structures which happen to be suitable as shelters and nesting-places. Thus he brings his observations into line with those of recent workers on "myrmecophily" in plants, and consequently is in opposition to the school typified by Belt and Beccari.

Enough, perhaps, has been said to show that these volumes, besides containing a wealth of information for the pure systematist, bristle with points of general interest for all naturalists. It is difficult to know if Dr. Sjöstedt is more to be congratulated on the energy and zeal with which, in spite of attacks of malaria and blackwater fever, he formed these immense collections, or on the catholicity of his own studies of his collections, or on the rapidity with which these volumes have been published. To bring to a successful issue a monograph of this nature within four years is a work of which any man might well be proud. I can find only two words of adverse criticism. No good map accompanies the volumes. It is a pity that the proofs of those non-British zoologists, who elected to write their memoirs in English, were not more carefully revised; we should then have been spared such barbarisms as "youngs" (for "young ones"), "splitted up," and "changements."

R. S.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

January 11th, 1911.—Prof. W. W. Watts, Sc.D., M.Sc., F.R.S., President, in the Chair.

The following communication was read :—

'On a Collection of Insect-Remains from the South Wales Coalfield.' By Herbert Bolton, F.R.S.E., F.G.S., Curator of the Bristol Natural History Museum.

The Author describes nine examples of insect-remains, all being, with one exception, blattoid in character. Seven are described as new species. Six of the specimens were obtained from the horizon of the Mynyddislwyn Vein and Swansea Four-Foot Seam ; two from shales associated with the Graigola Seam, and a 22-inch seam occurring 40 yards below it ; while one specimen was found in shales associated with the Rhondda No. 2 Seam, and therefore on the same horizon as the example of *Etoblattina (Archimylacris) woodwardi*, Bolton, previously described by the Author in the 'Geological Magazine' for 1910, p. 147.

The whole of the insect-remains are referable to three horizons—one at the base of the Upper Series of the Coal Measures, and two in the upper part of the Pennant Series. Two indeterminate species are referred to the genus *Archimylacris*, two to *Hemimylacris*, one to *Archimylacris (Schizoblatta)*, one to *Archimylacris (Etoblattina)*, one to *Gerablattina (Aphthoroblattina)*, one to *Orthomylacris*, and one to *Lamproptilia*. The last-named genus is new to the British Coal Measures. Attention is drawn to the association of the blattoid remains with *Cordaites* leaves bearing the impressions of the tests of *Spirorbis pusillus*. The suggestion is put forward that possibly Carboniferous cockroaches were not only phytophagous in habit, but frequented decaying *Cordaites* leaves in order to feed upon the *Spirorbis*.

The presence of Archimylacrid and Orthomylacrid forms, no less than the presence of a species of *Lamproptilia*, is considered indicative of a considerable advance in insect development in the British Carboniferous beyond the more primitive palæodictyopteran types; while their abundance in the Pennant and Upper Series of the South Wales Coalfield may justify the hope of finding more primitive forms at a lower horizon in the same coalfield. Their occurrence may also be indicative of the remains of a terrestrial fauna somewhere in the South Wales Coal Measures.

March 8th, 1911.—Prof. W. W. Watts, Sc.D., M.Sc., F.R.S., President, in the Chair.

The following communication was read:—

'Contributions to the Geology of Cyrenaica.'
By Prof. J. W. Gregory and others.

(i) The Geology of Cyrenaica. By John Walter Gregory, D.Sc., F.R.S., F.G.S., Professor of Geology in the University of Glasgow.

According to the scanty evidence available in 1908 regarding Cyrenaica, which Hildebrand described in 1904 as 'heute noch so gut wie unbekannt,' the country might be interpreted as a fragment of a mountain-loop, an off-branch from the Atlas, or as a plateau of Miocene rocks.

In a journey across the country, the Author found that it was a plateau of Lower Kainozoic Limestones, which are classified as follows:—

Oligocene (Aquitanian)	Cyrene Limestones.
Eocene	Slonta Limestones = Priabonian. Derna Limestones = Moqattam Series of Egypt. Apollonia Limestones = Libyan Series of Egypt.

Some Miocene limestones occur in places on the plateau, and lying against its western foot.

These rocks are all limestones, containing very little clastic material. They must have been deposited in a clear sea, at depths ranging down to nearly 1000 fathoms.

Intervals of shallow sea are indicated by some limestone-conglomerates and a band of coral-reef limestone. The country was uplifted in later Miocene times, and was then part of a wide land which included Crete and occupied the site of the Ægean Sea. This land was broken up by great subsidences, which left Cyrenaica as a horst bounded by fault-scarps on the north and west. Eastwards the country sinks by a slight dip and a succession of faults, until the Miocene limestones, which occur on the plateau in Cyrenaica, are at sea-level on the coasts of Western Egypt. Cyrenaica may thus be regarded as part of the western limb of the geosyncline of Western Egypt.

The formation of the river-valleys probably began during a period of wetter climate than the present, but there is no evidence of any appreciable change in the climate or water-supply since the date of the Greek and Roman colonization.

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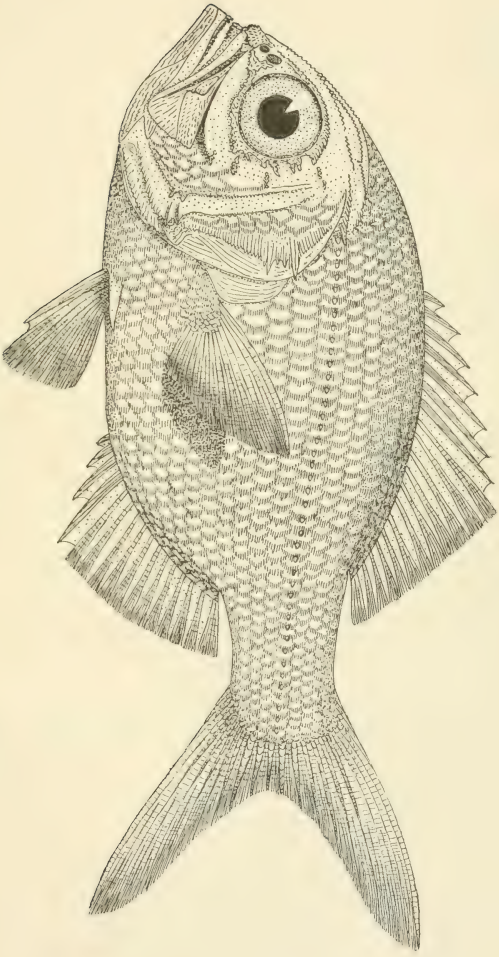

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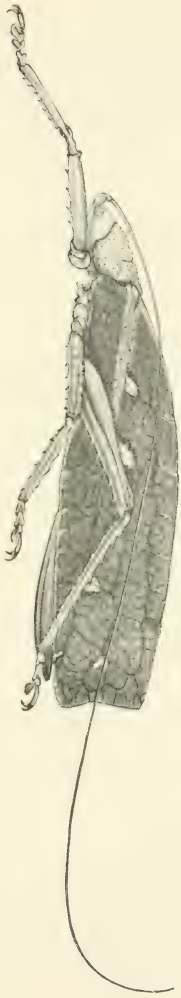

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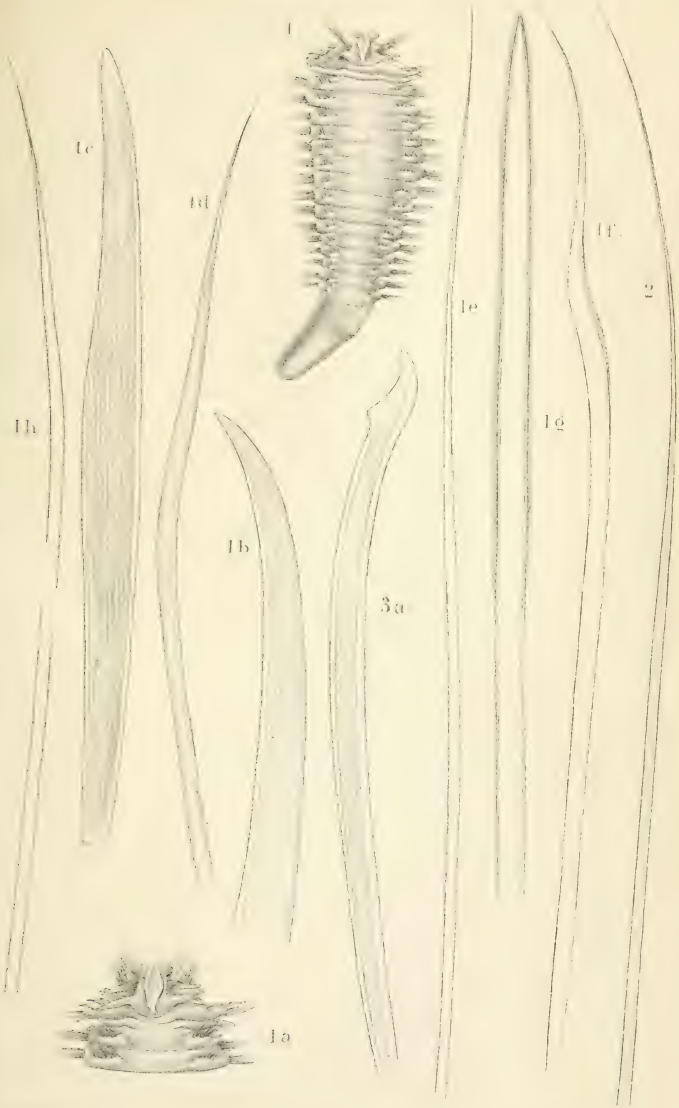

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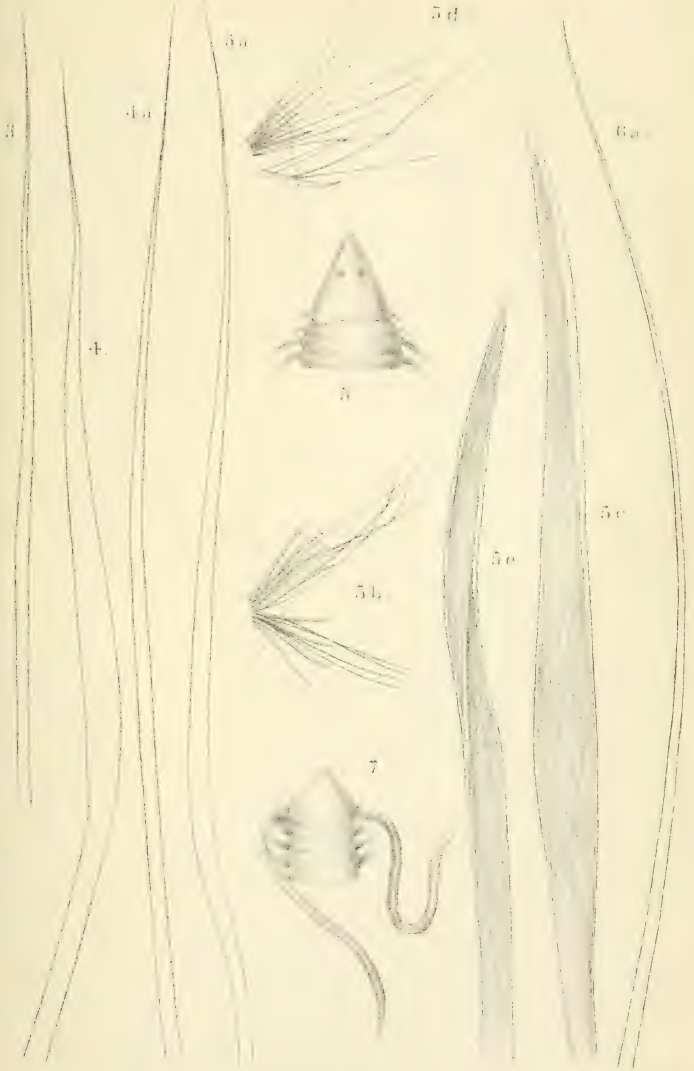
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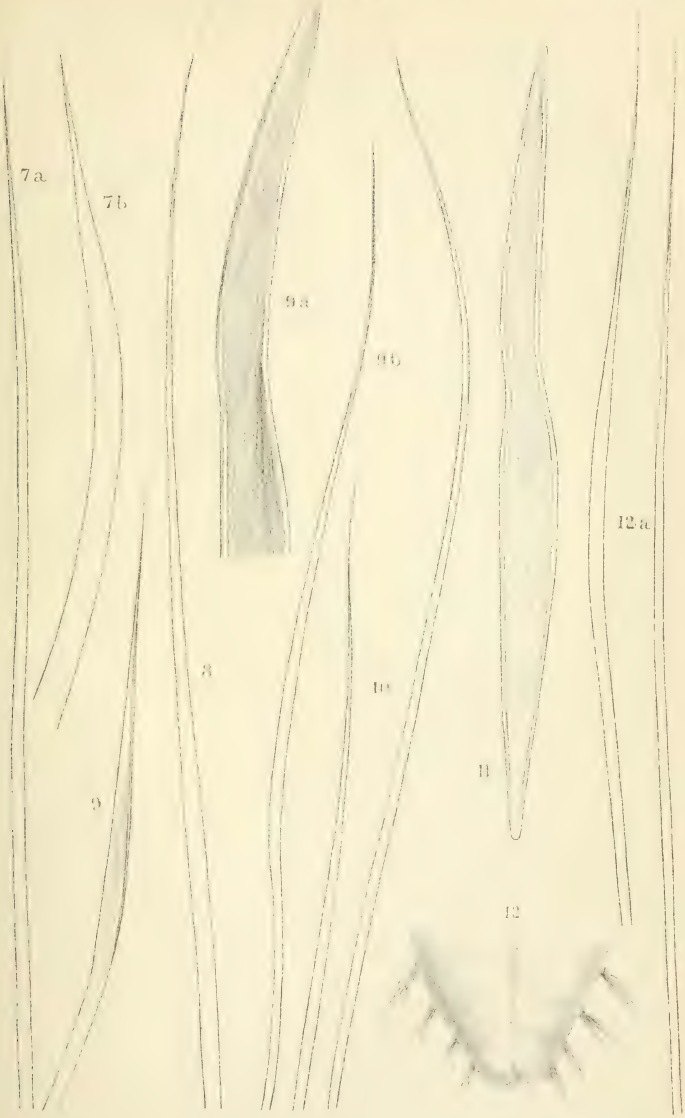

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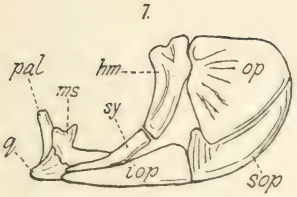

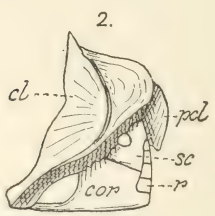

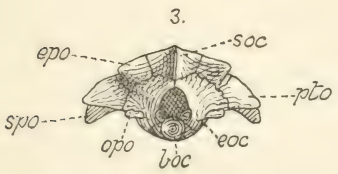

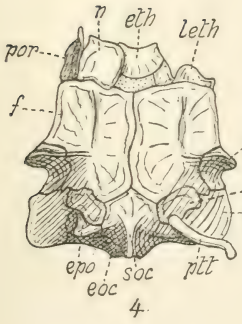

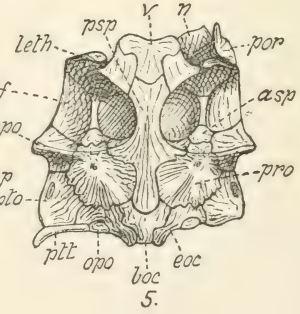

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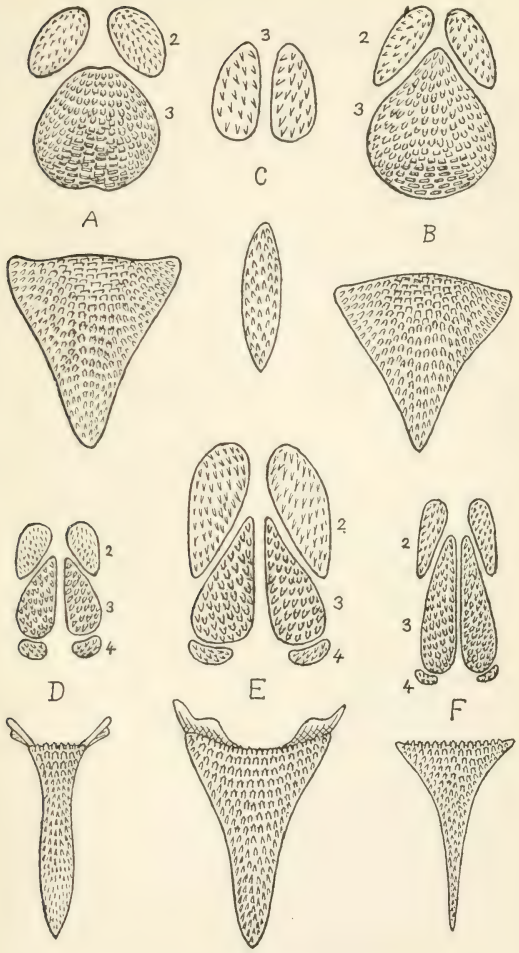

PHARYNGEALS OF SYNENTOGNATHI.

A–B. Exocœtoidea; C–F. Scombresocoidea.

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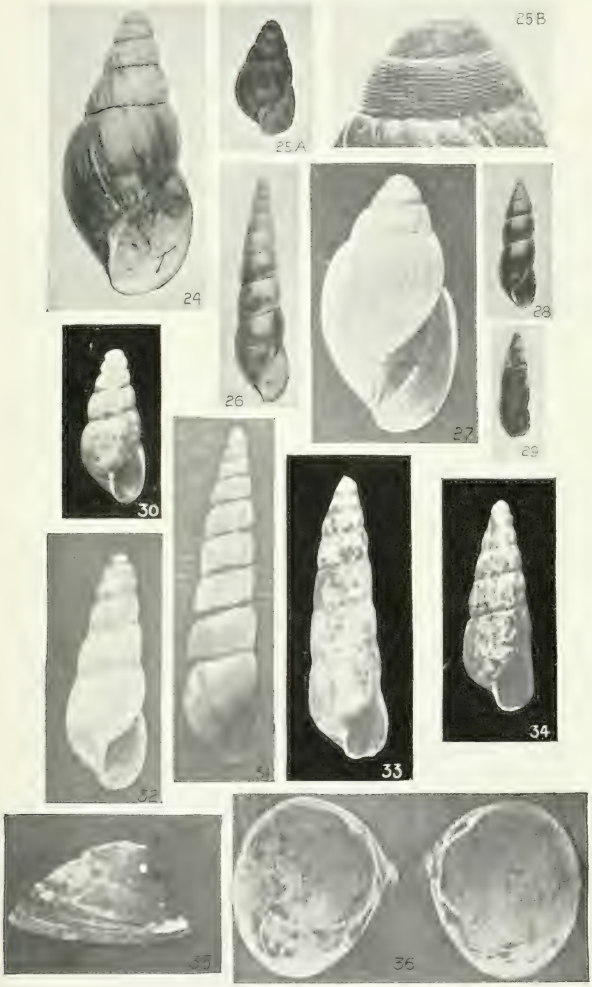
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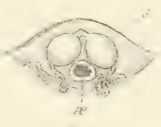

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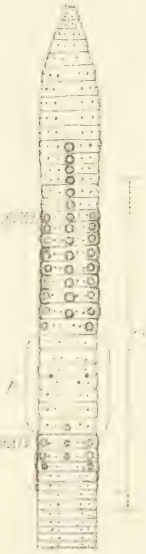

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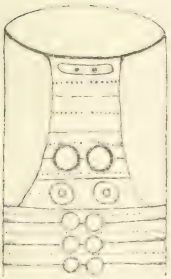

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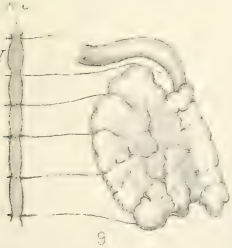

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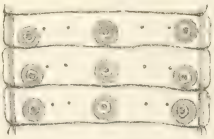

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